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OBSERVATIONS

ON THE

Diseases of the Army,

BY

JOHN PRINGLE,

Physician in Ordinary to Her Majesty.

The FIFTH EDITION corrected.



L O N D O N :

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P R E F A C E.

THE diseases of the army, as far as it appears, have been treated of by none of the ancient physicians; nor have we any information about them from the historians, unless when some uncommon or very fatal distemper attended an expedition. Xenophon, in his relation of the famous retreat of the Greeks, mentions their being liable to the fumes canina, to blindness, and to a mortification of the extremities, from the snow and excessive cold which they were exposed to on their march. Pliny, the naturalist, is the first who takes notice of the stomacace, the distemper now called the scurvy, which afflicted the Roman army in Germany after it had continued two years in that country*. We likewise find the Romans under a necessity of shifting their camps, on account of the noxious vapours from the adjacent marshes. Plutarch observes, that Demetrius, in his last expedition, lost above eight thousand men by a sickness which followed

* Ancient Germany included the northern parts of the Netherlands; and it seems to be that marshy country which PLINY means; for, he subjoins these words *trans Rhenum maritimo tractu*, which agree with the account that TACITUS gives of the expedition under GERMANICUS.

a scarcity of provisions. Livy informs us of a pestilential distemper that seized both the Romans and the Carthaginians in Sicily. And Diodorus Siculus describes another pestilence, attended with a flux of blood, which almost utterly destroyed the latter at the siege of Syracuse: and though he refers the immediate cause of this calamity to the Gods, incensed against that people on account of their impiety, yet he explains the natural causes in a more full and satisfactory manner, than is usually done by historians on like occasions.

But excepting these and a few more instances, there remains no account of the diseases incident to the armies of the ancients. It may seem strange that Vegetius, in his book de re militari, should write a chapter containing directions how to preserve the health of soldiers, and yet not mention any disorder which they were particularly subject to; and that he should speak of the physicians attending the camp, without taking notice of their manner of disposing of the sick, whether in hospitals or otherwise. The silence of the ancients upon this article is the more to be regretted, because as war was their chief study, it might be expected that the orders relating to the care of the sick, were good in proportion to their skill in the other branches of the military art. And indeed as their troops were constantly in the field, and in different climates,
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the physicians of those days had it greatly in their power to furnish many useful observations on the nature and causes of camp-diseases, and on the proper methods of treating them.

Nor had this defect been supplied, when I was first employed in the army, by any of the modern authors whom I had read, unless by such as had either little or not at all attended the service, at least the military hospitals; and who, on that account, could not be supposed to write better on the diseases there, than that author who composed a treatise on the art of war, without having seen a campaign. So that after all, this part of medicine, which ought long ago to have been complete, seemed to be still in a manner new: so little is a military life consistent with that state of tranquillity requisite for study and observation.

Perceiving therefore what little assistance I was to expect from books, I began to mark such observations as occurred, in hopes of finding them afterwards useful in practice. And having continued this method to the end of the former war, I then put those materials into order, and with as much clearness and conciseness as I could, endeavoured from my own experience to supply, in some measure, what I thought so much wanting on this subject.

I have

I have divided the work into three parts. In the first, after a short account of the air and diseases more peculiar to the Low-Countries (so often the seat of our wars) I give an abridgment of the medical journal which I had kept of the several campaigns. In this I mention the epidemics, as well as the more frequent diseases of our troops, in the order in which they occurred, the embarkations, marches, encampments, cantonments, winter-quarters, the seasons, the changes of the weather, and in a word all the circumstances that seemed to me most likely to affect the health of an army. In this part I have entered but little into the description of diseases, much less have I touched upon their cure, reserving both those subjects to be treated of afterwards. My chief intention here, was to collect materials for tracing the more evident causes of military distempers, in order that whatever depended upon those in command, and was consistent with the service, might be clearly stated, so as to suggest measures either for preventing, or for lessening such causes in any future campaign. And I have been the more studious of exactness in this account, as I foresaw that in whatever manner the whole was to be received, this part at least would be acceptable, as being a narration of facts by one who was present and employed all the time. My inferences are few and short, as a full discussion of those points would have too much interrupted

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rupted the series of incidents that were to be presented in this place, at one view.

I have therefore thrown most of the reasoning that results from the first part into the second, in which, after having divided and classed the diseases common to a military life, I inquire into the more general causes of them, namely such as depend upon the air, the diet, and other circumstances usually comprehended under the appellation of the non-naturals. And here I have ventured to assign some sources of disorders, very different from the sentiments of other writers upon this subject; and I have also shewn how little instrumental in producing sickness some other causes are, which have been thought the most frequent of any. Nor will this liberty, I hope, be condemned, when it is considered what opportunities I have had beyond others to make such remarks; and that as natural knowledge is daily improving, those authors who write last on subjects connected therewith are most likely to be in the right.

Among the chief causes of sickness and death in an army, the reader will little expect that I should rank, what is intended for its health and preservation, the hospitals themselves, on account of the bad air and other inconveniencies attending them. However, during the
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former war one considerable step was made towards their improvement. Till then it had been usual, for the security of the sick, to remove them a great way from the camp, whereby many were actually lost before they came under the care of the physicians; or, which was attended with equally bad consequences, if the hospitals were nigh, they were for the same reason frequently shifted according to the motions of the army. But the Earl of Stair, my illustrious patron, being sensible of this hardship, when the army was encamped at Aschaffenburg, proposed to the Duke de Noailles (of whose humanity he was well assured) that the hospitals on both sides should be considered as sanctuaries for the sick, and mutually protected. This was readily agreed to by the French general, who took the first opportunity to shew a particular regard to his engagement. For, when our hospital was at Feckenheim, a village upon the Maine, at a distance from the camp, the Duke de Noailles having occasion to send a detachment to another village upon the opposite bank, and apprehending that this might alarm our sick, he sent to acquaint them, that as he knew the British hospital was there, he had given express orders to his troops not to disturb them. This agreement was strictly observed on both sides during that campaign, and though it has been since neglected, yet it is to be hoped that on future occasions the contending parties will make it a precedent.

After

After having explained the general causes of the sickness in armies, I proceed to point out the means of removing some, and rendering others less dangerous ; for, without this addition the former considerations could have been of little use. But it is easy to conceive, that the prevention of diseases cannot depend on the use of medicines, nor upon any thing which a soldier shall have in his power to neglect, but upon such orders as shall not appear unreasonable to him, and such as he must necessarily obey.

I conclude the second part with comparing the numbers of the sick at different seasons, in order that the Commander may know, with some degree of certainty, what force he may at any time rely upon for service, the effects of short, or long campaigns upon the health, the difference between taking the field early, and going late into winter-quarters, with other calculations founded upon such materials as were furnished by the war. The data are perhaps too few to deduce certain consequences from them, but as I found no other which I could depend upon, I was obliged to make the best use of these, which at least will serve for a specimen of what may be done in this way upon further experience.

These two parts being intended for the use of officers as well as physicians, I have endeavoured to relate the

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facts

facts and draw my inferences in the plainest manner, and with as few scientific terms as was consistent with the nature of the subject; and I hope with perspicuity enough to be understood by any reader not unacquainted with the common principles of natural knowledge.

But the third part, containing the practice, is designed for those of my own profession only, as it could neither be properly explained, nor prove instructive to others. In composing this from my notes I was long in doubt how to proceed, whether wholly to omit such things as were commonly known, or to treat all the disorders mentioned there in a full and regular manner. But at last I determined upon the following course. I conceive the diseases, to which an army is most subject, to be divisible into two classes; one, comprehending those which are also common in Britain; and the other, such as are more peculiar to a different climate, or to the condition of a soldier. Now, as the first have been fully treated of by several learned authors in the hands of every physician, and also occur in daily practice, I pass them cursorily over, being satisfied with laying down my general method of proceeding, with the difference, if any, to be observed in prescribing in military hospitals.

*But with regard to the other class, including the bilious, and malignant fevers, and the dysentery, as they
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are disorders less frequent in this country, I thought proper to handle them more at length, and indeed in so full a manner, as I hoped might instruct those who had been little conversant with them before.

*My observations on the hospital or jail-fever were first published in the year 1750, in a letter to Dr. Mead. But as that piece was hastily written, occasioned by the jail-distemper breaking out at that time in London, some things were omitted, and mistakes were made, which I have since endeavoured to supply, and rectify in this work wherein that dissertation is included *.*

To this account of the hospital or jail-fever, as well as to that of the bilious fevers and the dysentery, I have subjoined my conjectures about their internal and more latent causes, though I am aware that an attempt of this kind may tend rather to weaken than confirm my observations; as we too often see the judgment influenced and perverted by such speculations. But the reader may be assured

* In the year 1722, a treatise was published here, intitled *A Rational Inquiry into the Nature of the Plague, drawn from Historical Remarks*, by JOHN PRINGLE, M. D. As the subject was similar to mine, and as the author was of the same name, the writer of the Index to M. DE HALLER's edition of BOERHAAVE's *Methodus Studii Medici* has referred this piece, my Letter to Dr. MEAD, and my Inaugural Dissertation (at Leyden) *de Marcore Senili*, to one person. In justice therefore to the worthy author of that *Inquiry*, I take this opportunity of informing the public of this mistake, which indeed it was natural for a foreigner to fall into.

that not only the descriptions, but the treatment of all these diseases were in a good manner fixed before I thought of assigning those causes, and which indeed were sometimes first suggested by the effects of the medicines. Yet a theory may be useful, not only for discovering more powerful remedies, but for varying those we are already acquainted with, oftener than can be taught either by mere empiricism, or even by analogy from other fevers.

In reasoning upon the nature of these distempers, I have so much recourse to the septic principle, that the reader may imagine that I have considered it as a more universal cause than I really think it; but excepting these and one or two more I have alluded to in this work, I have hitherto referred no other disorder to that origin. As to the reality of such a principle, though I think I have sufficiently ascertained it in these sheets, yet to some it may be satisfactory to know, that the corruption of the humours, as the cause of certain diseases, was first hinted at by Hippocrates, further taken notice of by Galen, and still more fully treated of, and applied to medicine in later times, as appears by the Aphorisms of Sanctorius, and other noted works of his age. And though it was afterwards sunk in the systems of Sylvius, and of Willis, as well as in that of the first mechanic writers, yet it was revived by Hoffman and Boerhaave; and especially by the latter, who
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under the article of alkalis comprehended all that he thought septic or putrid. But as that celebrated physician had not time to ascertain every part of his doctrine from his own experience, it was no wonder that some mistakes were made, and that the extent of this principle was not fully understood.

Two things induced me to prosecute this subject; the great number of putrid cases that were under my care in the hospitals abroad; and the authority of Lord Bacon, who offers good reasons for considering the knowledge of what brings on, and retards putrefaction, as most likely to account for some of the more abstruse operations of nature. My papers on this subject being read at several meetings of the Royal Society, the three first were published in the Transactions; but while the rest were still in the hands of the secretary, in order likewise to be inserted there, finding it necessary to make frequent references to those experiments, I thought it proper to annex the whole to this work, in the same order wherein they were presented; with the addition only of some notes, to explain what might not have been fully or clearly enough expressed before, and by way of connecting those facts with the preceding observations.

This work was first published in the year 1752, and reprinted in the year following with some additions. In
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the third edition I corrected some of my observations, from further experience in the camps which I attended in England, for three seasons in the beginning of the last war, before I quitted the service. But as I found the diseases of those hospitals similar to what had occurred during the former war, though milder on account of the nature of the climate, and from the soldiers not suffering the hardships which troops are exposed to in sight of an enemy, I judged it unnecessary to offer any account of those easy campaigns.

In the fourth, and in the present edition I have revised the whole, and from more mature reflection, from my private practice, and from conversing with others who had been employed in the hospitals abroad, in different climates, from the beginning of the late war till the peace, I have had an opportunity of making further improvements, by expressing with more confidence some of my former remarks, about which I had been diffident before, and by omitting others which I had advanced without sufficient foundation. I have likewise added some new observations to most of the articles in the third part, and especially to the chapter on the dysentery, having had more experience in that distemper, which though uncommon in this place was frequent in autumn 1762.

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I am sensible that notwithstanding all my care and attention, both in making the observations and the experiments, and the repeated opportunities which I have had of revising and correcting this work, not only many inaccuracies but mistakes may have escaped me, which those will most readily excuse, who having themselves made researches of this kind are not unacquainted with the difficulties attending their publication. Yet, however imperfect these sheets may be, I have the satisfaction to find that they have served as a foundation for others to build upon, who, by making improvements on these subjects, have concurred with me in attempting to draw from the calamities of war some benefit to mankind.

London, 13 September, 1765..



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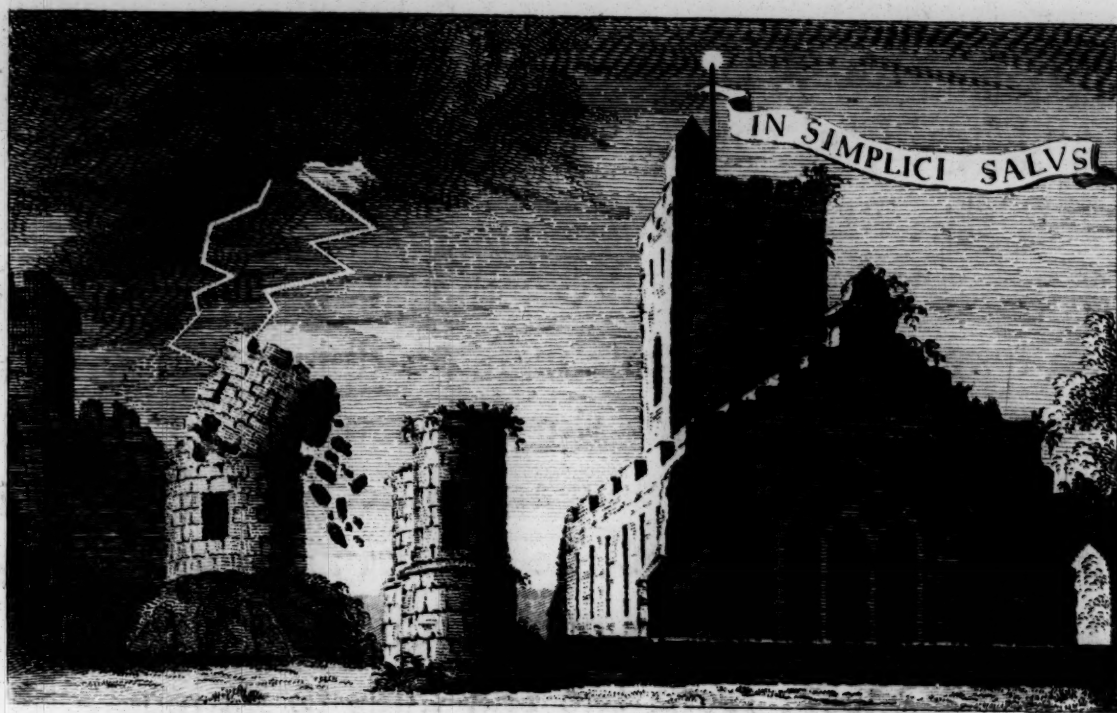
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OBSERVATIONS
ON THE
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PART I.

CHAP. I.

Of the air and diseases of the Low-Countries.

THE river *Lis* rising in *Artois*, and joining the *Scheld* at *Ghent*, separates the high and dry part of *Flanders* from the low and wet. Between this line and the sea the country is flat, marshy and unhealthful, including several barrier towns belonging to the *Dutch*, the *French*, and the *Austrians*; of all which *Furnes* and *Sluys* are the most sickly. But the other part of *Flanders* being

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higher,

higher, is, as well as the rest of the *Austrian Netherlands*, a dry and healthful country.

Great part of the *United Provinces*, with *Dutch Brabant*, from *Grave* downwards along the *Maes*, being likewise low and wet, is subject to the same distempers with the flat part of *Flanders*. But the air is worst in *Zealand*; as that province is not only low and watery, but surrounded with the oozy beaches of the eastern and western *Scheld*, and the most marshy parts of the country; so that almost every wind, except from the sea, adds to its native moist and unwholesome exhalations.

All this tract of the *Netherlands* being little higher than the level of the sea, or the rivers that pass through it, was once so much exposed to inundations from floods and high tides, that till dykes and drains were made it was one large morass; and even now, after incredible labour, the country is liable to be overflowed by extraordinary floods and other casual inlets of water. By the evaporation of this water, as well as by that of the numerous canals and ditches, in which various plants and insects die and rot, the atmosphere, during the latter part of summer and autumn, is filled with moisture, and with putrid and insalutary vapours.

A second, but less obvious source of humidity, is from the water under ground, which in that country lies so near the surface, that a dry ditch is seldom seen; and as the soil is light, the moisture easily transpires, and in summer

mer loads the air with vapour, even where no water is visible. This is the condition of most of *Dutch Brabant*, where the people are more or less subject to intermitting fevers, in proportion to the distance of this water from the surface; so that by looking into their wells, one may form a judgement of the comparative healthfulness of the several villages: for these wells being fed by the subterraneous water, with which they are always on a level, and sinking in proportion to the droughts of summer, are a proof of the constant exhalation of this concealed moisture, through the pores of the earth, by the heat of the sun.

In *Zealand*, and upon the coasts of *Flanders* and *Brabant* opposite to that province, is observed a peculiar kind of damp, rising at low water from a beach that is covered with slime and mud, and which is perhaps the more apt to corrupt on account of the mixture of the fresh with the salt water*. In those parts the people are sickly; but at *Ostend*, which is situated upon the ocean, and where there are no marshy grounds very near, the inhabitants are in general healthy.

Another cause of the humidity and corruption of the atmosphere, is an imperfect ventilation. There are no hills to direct the winds in streams upon the lower grounds; hence the air is apt to stagnate, and the more so by reason of

* Vide LANCIS. De Nox. Palud. Effluv. lib. i. p. i. c. v.

the large plantations made for pleasure, inclosure, or fuel. The farms and smaller villages are crouded with trees, which not only confine but moisten the air by their transpiration. But in the towns, in which there is less of this kind of moisture, where the houses and pavement of the streets in a great measure prevent the rising of the damps, and where are continual fires, the aquatic diseases are both milder and less frequent.

To these causes of fevers in flat and marshy countries, may be added the impurity of the water in common use; which being either collected from rains, preserved in cisterns, or drawn from shallow wells, is in hot and dry seasons soon corrupted. This being the case, the general tendency to putrefaction must be increased by the use of such water, as well as by the meats, which in a close, hot and moist air are easily tainted. Several circumstances therefore in that country concur in summer, not only to relax the solids, but to dispose the humours to putrefaction; and as the combination of heat and moisture is the great cause of the speedy corruption of animal substances, so it is observed in every place to produce fevers, and other distempers of a putrid kind, similar to those that occur in the low and marshy parts of the *Netherlands*.

This is the nature of the country. But according to the various degrees of heat and moisture of the season, the epidemic diseases begin earlier or later, are of longer or shorter duration,

duration, and are attended with milder or more alarming symptoms. When the heats come on soon, and continue throughout autumn, not moderated by winds and rains, the season proves sickly, the distempers appear early and are dangerous. But when the summer is late, or tempered by frequent showers and winds, or if the autumnal colds begin early, the diseases are few, their symptoms mild, and their cure easy *.

And here it may be proper to distinguish between the moist and the rainy seasons; for in marshy grounds, intense and continued heats, even without rain, occasion the greatest moisture, by the exhalation which they raise and support in the atmosphere; whereas frequent showers, during the hot season, cool the air, check the rise of the vapours, dilute and refresh the corrupted water, and precipitate the putrid and noxious *effluvia*. But if heavy rains fall in the beginning of summer, and are followed by great and uninterrupted heats, then the water collected by the rain, stagnating in the lower grounds and corrupting there, furnishes matter for more exhalation, and thereby renders the season more sickly and the diseases more fatal.

It ought also to be remarked, that the sickness never begins till the heats have continued long enough to give

* All this is agreeable to the register of the weather and diseases, kept for several years by Dr. STOCKE physician at *Middelburgh* in *Zealand*.

time for the putrefaction and evaporation of the water. The epidemics of this country may therefore be generally dated from the end of July, or the beginning of August, under the canicular heats; their sensible decline, about the first falling of the leaf; and their end, when the frosts begin: the rest of the year is much less disposed to produce any distemper.

Again, we are to observe, that though in the month of September the greatest heat of the season is past, yet the distempers continue, from the greater variations of heat and cold; for the days are still warm, but the nights are cold and damp, often foggy; and it is by such interchanges that the perspiration is checked, and the more putrescent parts of the blood retained in the body, where they produce either a fever or a flux. It is also to be remembered that the summers are hotter on the continent than in *Britain*; and that in the *Netherlands* the heats are more stifling than in hilly countries.

The epidemic of autumn, and prevailing distemper of this and other marshy countries, is a fever of an intermitting nature, commonly of a tertian form, but of a bad kind; which, in the dampest places, and worst seasons, appears as a double tertian, a remitting, a continued putrid, or even an ardent fever*. All which, however varying in

* An ardent fever is defined, part iii. ch. iv. § 2.

their

their appearance, according to the difference of constitution and other circumstances, are nevertheless of a similar nature; for though in the beginning of the epidemic, when the heats are greatest, the fevers assume a continued and ardent form, yet by the end of autumn they usually terminate in regular intermittents.

In *Zealand*, where the air is worst, this fever is called the *Gall-sickness*; and indeed both the redundance and depravation of the gall in this distemper are sometimes so great, that it was natural to refer the cause to the corruption and overflowing of that humour. But whatever be the immediate cause, the disease may possibly be continued, and the symptoms aggravated by an increased secretion and putrefaction of the bile, occasioned by the fever. There may be in this, as in other disorders, a first cause producing an effect, and that effect producing new symptoms.

In proportion to the coolness of the season, to the height and dryness of the grounds, this fever is milder, remits or intermits more freely, and recedes farther from the nature of a continued putrid, or an ardent fever. But to judge from its worst state, we must refer most of the symptoms to a septic origin; since these fevers are attended with intense heat and drought, foulness of the tongue, bitterness in the mouth, desire of acids, a *nausea*, aversion to animal food, offensive vomitings, great oppression
about

about the stomach; sometimes with livid spots, and the like indications of corrupted humours. And as, with such symptoms, the disease still puts on an intermitting or remitting form, it should seem as if even the more benign intermittents of the season were owing, in a lesser degree, to the same cause.

The *cholera* and the dysentery, though rarely epidemic, are nevertheless frequent diseases of moist countries. They appear in the same season with the fevers, and seem to be particular determinations of the vitiated humours; to which, if the first passages give vent, a *cholera*, or a flux ensues; but if they be retained, and carried into the blood, they produce an intermitting, a remitting, or a continued fever.

Both fevers and fluxes are often accompanied with worms, which are not to be deemed the cause of either, but only a sign of the bad state of the bowels, of the corruption of the aliment, and of a weakness of the fibres of the intestines, owing to the heat, moisture, and the putrid state of the air.

These are the acute epidemics of the marshy parts of the *Netherlands*. The chief chronical disorder is a scurvy incident to those who live in a moist and corrupted air, and especially if they use salted meats: this though in a milder degree, yet agreeing so nearly with
the

the sea-scurvy, may be accounted the same disease. The exhalations of the canals and marshes in hot weather act like the steams of a foul and crowded ship; they corrupt the blood, and stop perspiration. The sea air is not the cause of the scurvy; for on board a ship, on the longest voyages, there are preservatives against the marine scurvy; and upon the sea-coast, it is not in the dry and elevated parts, but in the flat and marshy, where the inhabitants suffer by that distemper*.

In general, it is the higher ranks of people who are least liable to the diseases of the marshes. For such countries require dry houses, apartments raised above the ground, moderate exercise without labour in the sun or in the evening-damps, a just quantity of fermented liquors, and victuals of good nourishment. Without such helps, not only strangers but the natives themselves are sickly, especially after hot and close summers. The hardiest constitutions are little more exempted than others, and therefore the *British* soldiers have always been subject to these fevers and fluxes in the *Netherlands*; not indeed to the scurvy, as their stay in the moister parts of the country has never been long enough to contract that disease.

Now, though in the marshy parts of *Flanders* and *Holland*, the summer and autumnal distempers are frequent

* The nature of the scurvy is more fully explained in the Appendix, Paper vii, under experiment xlviii.

and violent, yet there are few countries, however dry, that are totally exempted from them. For the heats, if great, relax the solids and tend to corrupt the humours; under which circumstances, if the body be exposed to fogs and nocturnal damps, to any stoppage of perspiration, or receives improper food, the same kind of disorders, though less characterized and less frequent, will be incident to dry as well as to marshy countries. Hence, even in the driest damps, after great and continued heats, these summer and autumnal fevers and fluxes are more or less common; for, besides the natural moisture of a tent, the men will either by duty or by misconduct often suffer from wet ground, wet clothes, nocturnal damps and colds. And the danger of their falling into these diseases is the greater, as the interchanges of heat and cold are more sensible and frequent in the field than in quarters.

But a sudden stoppage of perspiration, coming upon relaxed fibres and a putrescent state of the blood arising from a constant exposition to the sun, if not timely remedied, will generally occasion a remitting or an intermitting fever, a *cholera*, or a flux; so that these distempers may be considered almost as incident to a camp as to a low and marshy country.

CHAP. II.

A general account of the garrison diseases of the British troops, in Flanders, and in the cantonments in Germany, in the years 1742, and 1743.

IN the beginning of June, 1742, the *British* troops began 1742. to embark for *Flanders*. There were in all, of foot and cavalry, about 16,000: the winds were favourable, the several passages short, the men landed in good health and went into their several garrisons.

The head-quarters were at *Ghent*, with most of the cavalry, three battalions of guards, one marching regiment, and the artillery; eight battalions were quartered at *Bruges*; two at *Courtray*; a regiment of dragoons lay at *Oudenarde*; and another was divided between *Alost* and *Grammont*. There was a general hospital at *Ghent*, but in the other garrisons, the care of the sick was committed to the surgeons of the respective regiments.

During the summer and autumn the weather was good, the heats moderate, and the country in general healthy. The *British* officers continued well, but many of the common men sickened; and this seems to have been the reason.

Ghent is situated between the high and the low division of *Flanders*; one part of the town, called *St. Peter's-hill*, is

1742. much higher than the rest, and in this the barracks, having drains and free air, were quite dry; so that the soldiers who lay there enjoyed perfect health. But those who were quartered in the lower part of the town (mostly on the ground-floors of waste houses, unprovided with drains, and of course damp) were sickly. The battalion of the first regiment of guards was a remarkable instance of this difference of quarters. Two of the companies lay on *St. Peter's-hill*, the remaining eight in the lower part of the town, in rooms so very damp that they could scarce keep their shoes and belts from moulding. In the month of July, the sick of this battalion amounted to about 140; of which number only two men belonged to the companies on the hill, and the rest to those in the lower town. But in the middle of August, upon changing these unhealthy barracks, the sickness suddenly abated. The rest of the garrison suffered much less in proportion; the highest *returns* at no time exceeded 70 in a battalion of foot *, and 40 in a regiment of dragoons †. Now the *returns* including all accidents that unfit a soldier for duty, though the above numbers were more than triple what such corps commonly have at home, yet the sickness in this

* A complete battalion consisted then of 813, but after deducting the *ineffectives*, and the commissioned officers (who are never put into the *returns* of the sick) we are only to reckon this corps, when full, at about 750 private men and non-commissioned officers, whose names, upon being by indisposition unfit for duty, are once a week *returned* to the commanding officer of the regiment.

† This consisted of three squadrons, and each squadron of 158 men, not including commissioned officers.

garrison was accounted moderate. The highest returns 1742. were in the month of August, when the distempers were chiefly intermitting, and remitting fevers, diarrhœas, and a few dysenteries.

The sickness was more considerable at *Bruges*, a city of the lower division of *Flanders*, and moister than *Ghent*. The soldiers had besides damper barracks. The remitting and intermitting fevers began in July; but in August the intermittents were most numerous, which continued throughout September, diminished in October, and ceased upon the setting-in of the frosts in November. These fevers were not only of a worse kind than those at *Ghent*, but three times more numerous, and more in proportion died. Next to the fever, fluxes were most frequent; and though not always with blood, were generally of the dysenteric kind. It was then observed, that such as lay in the upper stories enjoyed much better health than those who were below on the ground-floors, which were all very damp.

The two battalions at *Courtray* were differently lodged; one had dry barracks, the other damp; and this last had double the number of sick throughout the autumn: but their greatest return did not exceed 70.

Oudenarde is in the higher division of *Flanders*; but the barracks being damp, having no drains, and the situation low,

1742. low, the Welsh Fuzileers, who lay there, suffered as much in proportion as the garrison of *Bruges*.

But at *Alost* and *Grammont*, towns in the same division, where the dragoons were billeted in private houses, that corps was so healthy, that when the army marched into *Germany* it left not a man behind.

The great number of sick, and our want of experience in the cure of diseases incident to a moist climate, were the reasons, that at this time the fevers were perhaps less successfully treated than afterwards. Many of the remittents degenerated into continued fevers, which were often fatal; and the intermittents, by being stopped before the proper evacuations were made, or not secured against relapses, changed likewise into continued fevers, or ended in dangerous obstructions of the *viscera*.

After the frosts in November, the intermittents never appeared, unless upon catching cold; and then only such as had been ill in autumn were subject to relapse.

Now, the autumnal epidemic ceased, and the winter disorders began, which were colds in various forms. The most common, were hard coughs, stitches, rheumatic pains, inflammations of the lungs, and the like; to all which, our soldiers, unused to garrison duty and cold quarters, and unprovided with clothes suited to the country, and

to the season, at this time particularly sharp, were very 1742.
subject.

There was no other considerable ailment except the itch, which indeed was soon after landing so general, that many believed that either the salt-provisions at sea, or the change of air, must have been the cause of so sudden and extensive a complaint. But this was solely owing to the contagion of a few, who having the distemper before the embarkation, communicated it to their companions on board the ships, and in the barracks after their arrival.

These were the principal diseases of our troops before they marched. The less frequent, were dropries and consumptions; whereof the former were the consequences of obstinate autumnal fevers ill cured; and the latter, of neglected colds.

But that which was the most alarming was a fever of a malignant nature, slow in its course, attended with a sunk pulse and a constant *stupor*: the novelty and danger, more than the number seized, made this distemper considerable. The cause was at first mistaken, but afterwards it appeared to arise from the foul air of some of the wards of the hospital crowded with sick; especially of one room in which a man lay with a mortified limb. This fever was confined to the hospital; and as it generally begins either
there,

1742. there, or in jails, it shall hereafter be distinguished by the name of the *jail* or *hospital-fever*.

1743. In the beginning of February, the troops moved from their winter-quarters, and marching into *Germany*, were cantoned in the country of *Juliers*, and at *Aix-la-Chapelle*. Only part of the cavalry was left at *Brussels*; and the sick and weak, to the amount of 600, being collected from all the garrisons, were put into the general hospital at *Ghent*. The weather being favourable, the troops entered *Germany* in good condition.

Soon after, the *Influenza* * passed through a great part of *Europe*; it was sensibly felt at *Brussels*, though but little in the cantonments, otherwise than that many, who in the preceding autumn had been seized with agues, then relapsed. As to the other disorders, they were the same as in *Flanders*, viz. coughs, pleurifies and the like, from taking cold in a rigorous season.

From the arrival of the troops at their cantonments till the beginning of May, the weather was very cold, with extraordinary snows, that began to fall towards the end of March and continued for seventeen days; in the midst of which the troops left their quarters, and crossed the *Rhine*. The march was long, and the roads deep; but as the soldiers came every night into warm houses, and had

* A short fever attended with a violent catarrh.

good provisions, so few fell sick by the way, that in both 1743. marches, from *Ghent* to the cantonments, and from thence to the place of encampment, in winter, and in the worst weather, we did not lose twenty.

In the beginning of May, the weather suddenly changed, and the troops, on the 17th, encamped at *Hoechst*, on the banks of the *Main*, in an open and healthful country.

CHAP. III.

A general account of the diseases of the British troops, during the campaign in Germany, in the year 1743; and the ensuing winter in Flanders.

THE ground, though naturally good, was not yet tho- 1743. roughly dry; and though the days were now warm, the nights were still cold and condensed the vapours. These interchanges of heat and cold, joined to the moisture inseparable from tents, could not but affect the health of men unused to the field; and accordingly many were seized with inflammatory disorders of fundry forms.

The flying hospital was opened at *Nied*, a village in the neighbourhood of the camp, which in three weeks received about 250 sick. When the number was 220, the distempers were classed, and stood thus: of pleurifies and

D

peripneu-

1743. peripneumonies, 71; rheumatic pains with more or less of fever, 51; inflammatory fevers, without rheumatic, or pleuritic pains, 25; intermittents, 30; hard coughs without fever, 9; old coughs and consumptions, 7. The rest had either fluxes, or some inflammatory symptom different from these; and several flighter cases remained in the camp. The intermitting fevers and fluxes were also accompanied with a considerable degree of inflammation.

This, with little variation, is the first state of the camp-diseases; for the nights being yet cold, and the ground wet, it is easily conceived in what manner our men must suffer, who lie in tents without any covering. Besides, soldiers are often exposed to rain, and have not the means of drying their clothes; at other times, for want of occupation, they are apt to lie down on the grass and fall asleep in the sun.

Hence the diseases, from the first encampment till past the summer solstice, are all highly inflammatory. Fluxes, remitting, and intermitting fevers, during this period are never general; and such as occur are never without some inflammation.

The cavalry had not near their proportion of sick, and indeed never have in camps; for the care of the horses gives the men an easy but constant employment, their cloaks keep them dry in rains, and serve for bed-clothes

at

at night. The officers enjoyed perfect health, as they 1743.
always do in the first part of a campaign.

On the 22d of June, we marched to *Aschaffenburg*, where the army encamped on a dry and airy field. In the hospital were left 500; so that in five weeks the proportion of the sick to the whole, was about 1 to 29. Before this motion of the troops, the sickness had sensibly decreased, and it still continued to decline in the new camp; for the weakest were already in the hospital, and the rest were somewhat inured to the field. Add, that the nights were now warm, and that there had been no rain to wet the clothes of the men, or the ground on which they lay.

On the 26th, in the evening, the tents were struck, the army marched all night, and next morning fought at *Dettingen*. On the night following, the men lay on the field of battle, without tents, exposed to a heavy rain; next day they marched to *Hanau*, where they encamped in an open field, and on good ground; but it was then wet, and for the first night or two they wanted straw. By these accidents, a sudden change was made in the health of the army. For the summer had begun early, and the heats had been great and constant; but the free and uninterrupted perspiration, attending those very heats, had as yet prevented any general sickness. Now, the pores were suddenly stopped, and the humours tending to putrefac-

1743. tion were turned upon the bowels, and produced a dysentery, which continued for a considerable part of the season. In the space of eight days after the battle, about 500 were seized with that distemper; and in a few weeks, near half the men were either ill, or had recovered of it. The disease was common, though not nearly so frequent, among the officers; of whom those were first seized who happened to lie wet at *Dettingen*; the rest suffered by contagion.

The dysentery, the constant and fatal epidemic of camps, began sooner this season than it did in any succeeding campaign. Now, as the usual time of its appearance is not before the latter end of summer, or beginning of autumn, the cause has been unjustly imputed to eating fruit in excess. But the circumstances here contradict that notion; for this sickness began and raged before any fruit was in season (strawberries excepted, which, from their high price, the men never tasted) and ended about the time the grapes were ripe, which growing in open vineyards were freely eaten by every body.

To this, add the following incident. Three companies of *Howard's* regiment, which had not joined us, marched with the King's baggage from *Ostend* to *Hanau*; where arriving a night or two before the battle, and having orders to stop, they encamped for the first time at a small distance from the ground that was afterwards occupied by the army.

army. These men had never been exposed to rain, nor had 1743.
lain wet; by this separation from the line, they were also
removed from the contagion of the privies; and having
pitched close upon the river, they had the benefit of a
constant stream of fresh air. By means of such favourable
circumstances, it was remarkable, that while the main
body thus suffered, this little camp almost intirely escap-
ed*; though these men breathed the same air, the conta-
gious part excepted, used the same victuals, and drank of
the same water. This immunity continued for six weeks,
until the army removed from *Hanau*; when these compa-
nies joining the rest, and encamping in the line, were at
last infected: but they suffered little, as the flux was then
much upon the decline.

The dysentery continued all the month of July and
part of August, to which the weather contributed. For
soon after the above-mentioned rains, which had cooled
the air, the heats returned, and for some weeks were so
great, that the humours, already disposed, were farther
prepared to receive the infection. Of this, the chief *sources*
seemed to be the foul straw and the privies; for, as soon
as we left that ground, on which we had so long encamp-
ed, the sickness visibly abated.

The numbers infected occasioned worse symptoms; as
in the case of the small-pox, plague, and every other pu-

* I heard of only one man that was taken ill of the bloody flux.

1743. trid and infectious distemper. But the flux is particularly destructive in full hospitals, where the corrupted steams being accumulated, are raised to a high degree of virulence; of which fact, this sickness afforded the following fatal instance.

The village of *Feckenheim*, a league from the camp, was employed for an hospital; into which, during our stay at *Hanau* (besides the wounded from the field of battle) about 1500 sick were sent from the line; and of that number the greatest part were ill of the dysentery. By these means, the air became so much vitiated, that not only the rest of the patients were infected, but the apothecaries, nurses and others employed in the hospital, with most of the inhabitants of that place. To this was added a still more alarming distemper, namely the jail or hospital fever, the common effects of foul air from crouds and animal corruption. These two combined occasioned a great mortality in the village; while such of the men as were seized with the dysentery, and not removed from the camp, though wanting many conveniencies that others had in hospitals, kept free from this fever, and commonly recovered.

On the 16th of August, we decamped from *Hanau*, and came to *Wiesbaden*; where four fresh battalions from *England* joined us. On the 23d, we crossed the *Rhine*; and on the 30th of the same month, encamped at *Worms*, along
the

the river, where we remained till the 25th of September. 1743. All these encampments were on dry ground, and in an open country.

The month of August was warm and dry, without fogs; and during the rest of the autumn the weather continued fine, allowing for the abatement of heat, and the usual dews of that season. In the end of August, though the days were still hot, the nights grew cool; and in the beginning of October the cold was so far advanced, that the fields were covered with hoar-frost in the morning.

From the time of our leaving *Hanau*, the dysentery so sensibly abated, that the change could only be ascribed to our leaving the infectious privies, the foul straw, and the filth of a long encampment. When the army crossed the *Rhine*, this distemper made but a third part of the sickness, from having been lately almost the only complaint. In a month after, it was scarce seen, unless in a few, who by reason of imperfect cures, colds, or errors in diet, happened to relapse.

About the middle of August, when the flux was on the decline, a new disease appeared, and daily increased as long as the troops kept the field. This was a remitting fever, the paroxysms of which came on in the evening, with great heat, drought, a violent head-ach, and often a *delirium*; all these symptoms lasted most of the night,
but

1743. but abated in the morning with an imperfect sweat; sometimes with an hæmorrhage of the nose, or a looseness. The stomach, from the beginning, was disordered with a *nausea* and sense of oppression, frequently with a bilious and putrid vomiting. If evacuations were either neglected, or too sparingly made, the patient fell into a continued fever; and sometimes grew yellow, as in a jaundice. When the season was farther advanced, so that colds became frequent, this fever was attended with a cough, rheumatic pains, and the blood was fizy. The officers were not so subject to it as the common men, being less exposed; and for the like reason the cavalry, who had cloaks to keep them warm in the nights, were less liable to fall ill. Others, who belonged to the army, but lay in quarters, were least of all affected; and the less in proportion to their being little exposed to heats, night-damps, and bad lodgings. This distemper, another constant epidemic of an army, shall hereafter be distinguished by the name of the *bilious*, or *autumnal remitting and intermitting fever of the army*.

Both in the dysentery and in this fever, several voided round worms; a symptom that occurred in these disorders every campaign. But we are not to imagine that the worms were the cause of the fever, or of the flux*; but only that when joined to either, they made them worse.

* See chap. i.

On the 25th of September, the army, free from the dysentery, but with a daily increase of the remitting fever, advanced to *Spiers*, but came back on the 13th of October. The weather, during this march, being cold and rainy, upon the return of the troops, above 800 were sent into the hospital, and most of them ill of this fever. 1743.

Three days after, the army moved to *Biberic*, and there breaking up camp, on the 25th of October, the *British* in different divisions began to return to the *Netherlands*. The weather being favourable to the march, which continued a month, and the soldiers coming every night into good quarters, so few fell ill by the way, that our troops arrived at their several garrisons with scarce the loss of a man.

But three thousand sick were left in *Germany*; part at *Feckenheim* near *Hanau*, and the rest at *Osthoven* and *Bechtheim*, two villages in the neighbourhood of *Worms*. The state of those at *Feckenheim* has been already mentioned*: there the hospital-fever and dysentery grew daily worse. Few escaped; for however mild or bad the flux was, for which the person was sent to the hospital, this fever almost surely supervened. The petechial spots, blotches, parotids, frequent mortifications, contagion, and the great mortality sufficiently shewed its pestilential nature. Of fourteen mates employed about the sick, five died; and, excepting one or two, all the rest had been ill, and in danger. The

* Page 22.

1743. hospital lost near half of the patients ; but the inhabitants of the village having first received the flux, and afterwards this fever by contagion, by the two were almost all destroyed.

The condition of the two hospitals near *Worms* was better ; the men had more room, they had been admitted in a cooler season, and the distempers were less putrid. But one general hospital being established at *Newied*, the sick were removed from their several quarters, and carried down the *Rhine* to that place ; where, by the change of air, those from *Feckenheim* were indeed at first relieved ; but the rest, who were mixed with them, caught the infection, which the following circumstance rendered still more general and fatal. For, orders coming soon after to remove all the sick from *Germany* to *Flanders*, they were embarked in bilanders, and conveyed by water to *Ghent* ; where they did not arrive till the middle of December. During this voyage, the fever having acquired new force by the confinement of the air, by the mortifications, and other putrid *effluvia*, it became so virulent, that above half the number died in the boats ; and several of the remainder, soon after their arrival. Its resemblance to a true plague was farther evinced by this memorable incident. A parcel of old tents being sent on board the same bilanders with the men, were used by them for bedding ; these tents, in order to be refitted, were put into the hands of a tradesman at *Ghent*, who having employed 23 *Flemish* journeymen

journeymen about the work, lost 17 of them by the disorder 1743.
temper which they received by contagion.

The proportion of men left in the hospitals at the end of the campaign, to those who came safe into garrison, was about 3 to 13.

The winter quarters assigned the troops, were *Brussels*, *Ghent*, *Bruges*, and *Ostend*: of these, *Brussels* is the highest and the best aired. But in winter, as there is little exhalation, and consequently no dangerous moisture in the air, the situation of the place is a matter of less consequence; so that the chief concern is to have warm and dry barracks, with a sufficient allowance of fuel. The best quarters were at *Brussels*; and accordingly the sickness was there inconsiderable, in comparison to what it was at *Ghent* and *Bruges*, where the dampness of the barracks, concurring with some remains of the diseases of the field, occasioned frequent disorders in the beginning of winter. For though the troops returned to *Flanders* in apparent health, yet, soon after their arrival, several were taken ill of the remitting fever attended with inflammatory symptoms: by which it appears, that the seeds of this fever may lie some time latent in the body, and break out upon catching cold, before the frosts have restored the tone of the bowels, braced the rest of the fibres, and purified the blood.

1744. In the beginning therefore of winter, these remittents were the prevailing disease of the garrisons; and next to them, jaundices without any fever. At *Brussels*, where the barracks were dry and warm, the fevers were few, and the jaundice uncommon; but at *Ghent* and *Bruges*, both were numerous. Yet the continuance of the fever was short; for it disappeared in December, and was succeeded by no other disorder than coughs and inflammations from colds, just as in the preceding winter.

No epidemic appeared in the spring. The only disease, besides colds, was the malignant fever, which came from *Germany*, and was still fatal in the hospital at *Ghent*. Some degree of it was likewise felt in the regimental infirmaries at *Bruges*, which had been too much crowded upon our first coming into winter quarters.

C H A P. IV.

A general account of the diseases of the campaign in Flanders, in the year 1744.

THE allies first encamped at *Anderlecht*, within a league of *Brussels*, on the 13th of May; on the first of June, we moved to *Berleghe*, and lay there till the 31st of July, when we crossed the *Scheld*, encamped at *Anstain*, in the territory

territory of *Lisle*, and there remained almost all the rest 1744. of the campaign.

This year the *British* took the field with five new battalions, and at *Berglehem* we were reinforced with five more from *England*; which number, with the *additional*s to the dragoons and with the recruits, made our national troops, in this campaign, exceed those of the former by upwards of ten thousand.

The first three days of the encampment were warm for the season, the succeeding ten were cold; but afterwards the weather becoming mild and so continuing, with moderate heats, the summer proved very favourable for the field. Before the army passed the *Scheld*, there being no hard duty, and the forage being at hand, the men suffered little by wet clothes, and had no fatigue: hence the sickness was so moderate, that during the first ten weeks encampment, we sent only about 600 into the hospitals, which were at *Ghent* and *Brussels*, viz. not above $\frac{1}{43}$ part of the whole.

Two thirds of these disorders were merely inflammatory, being either pleurifies, peripneumonies, quinseys, rheumatisms with fever, or the like. The rest were mostly vernal agues, with a few fluxes and other casual diseases, generally accompanied with inflammation, as in the beginning of the former campaign*.

* Page 18.

1744. Now, as to the inflammatory diseases of a camp, it may be proper once more to observe, that though upon first taking the field, coughs and stitches, with inflammations of the lungs and sides, are the common effects of catching cold, yet towards the summer solstice, as the weather grows warmer, the breast is less liable to be affected; so that the colds then are rather productive of a continued, or a remitting fever, with fizy blood, than of any of the above-mentioned inflammations. It ought also to be observed, that this fever, with proper management, may generally be removed in a few days; but when neglected at first, by the omission of bleeding, by the sick continuing in camp, or being carried in waggons to distant hospitals, it is never without danger.

After the army came into the territory of *Lisle*, an hospital was opened at *Tournay* on the 23d of August; into which at first were sent only 50 sick; and these being all that had been taken ill since the troops crossed the *Scheld*, shewed how healthful the camp then was. But in this small number there appeared a change in the disorders from inflammatory to putrid; most of them being either remitting fevers, or dysenteries.

From the end of August to the middle of September, there fell a great deal of rain; so that the men, who went out on foraging parties, were often wet; and the ground whereon the foot encamped being low, retained the

the water. Hence, by the first of October, we had in the 1744. hospital above 450 ill of the dysentery, besides some flighter disorders that remained in the camp.

This however was the height of that distemper, which, considering the number of our troops, was inconsiderable, compared to its frequency in the former campaign. The reason was plain; the last summer had been so hot, that by the end of June the humours had already acquired an acrimony; in which state, the rains at *Dettingen*, and the lying wet, giving a sudden check to perspiration, many were seized at once; and from thence sprung the infection, which was increased by the hot weather, and by the privies of a long encampment: but, by the temperature of this summer, the dysentery did not begin till late, and then could make little progress, from the constant coolness of the season.

The remitting fever of the camp, more regular in its appearance than the flux, began but a little later than in the preceding year, was frequent in the end of September, but never so general as before. The symptoms were also more moderate, and there was seldom any yellowness on the skin as in the former campaign; but when the weather grew cold, this fever was often attended with a cough, infarction of the lungs, or rheumatic pains; which symptoms, as was said above *, did not properly belong to the

* Page 24.

fever,

1744. fever, but were only accessions to it from extraordinary colds.

The rains were succeeded by fine weather, which continued till the beginning of October; but then being followed by heavy and cold rains, the sickness must have increased had not the campaign ended soon after: for on the 16th some of our troops were sent into winter-quarters, and in a few days they were followed by all the rest.

On breaking up, we had about 1500 sick in the hospitals at *Tournay*, *Ghent* and *Brussels*; which made only the 17th part of all that took the field. The number of those who died during this campaign, and in the hospitals after it, did not exceed 300. The mildness of the season, the dry encampments, the frequent exercise given to the troops by foraging parties (when the camp was fixed at *Anstain*) and the early retreat into winter-quarters, all concurred to preserve the health of the army.

The troops returning so soon and so well into garrison, carried with them few seeds of diseases. The dysentery, having been for some time on the decline, was but a little revived by the wet weather. And as half the army had been hardened by two campaigns, the remitting fever, in quarters, was chiefly confined to the recruits and new regiments which had encamped this summer for the first time.

The

The *British* returned to the same garrisons which they had left. At *Brussels*, the general hospital was kept up, but at *Bruges* and *Ghent*, the several regimental surgeons had orders to take care of all their sick in barracks which were provided for them, and they had medicines and other necessaries at the public expence. In each of these garrisons was stationed a physician, to whom those surgeons were occasionally to apply for assistance. This scheme of separate regimental infirmaries, though only intended to save the charge of one great hospital, answered another purpose, which was that of preventing infection, the common consequence of a large and crowded house.

At *Ostend*, remained two battalions, which having garrisoned the town during the campaign, enjoyed good health, with the exception of a few disorders. The remitting fever was unknown there, and the intermittents, with some mild fluxes, were confined to the common soldiers, who by out-guards and night-duty were most exposed to cold and wet; for neither our officers, nor the people of the place, had any sickness among them.

C H A P. V.

*A general account of the diseases of the campaign in Flanders,
in the year 1745.*

1745. **O**N the 25th of April, the army taking the field encamped again at *Anderlecht*, and on the 9th of May advanced to *Briffoel*.

The weather being mild, the sickness was moderate, and of the same kind with that of our former campaigns. Inflammatory disorders were common, and, as before, mostly in the form of a pleurisy, or peripneumony; not so often in that of an acute rheumatism, as the weather was yet too cold for tempting the men to sleep on the grass, the common cause of that distemper. The vernal intermittents were also of an inflammatory kind, as were likewise the few fluxes that appeared. The small-pox was the only new disease, which came with the recruits from *England*, but did not spread; and indeed we have never known it of any consequence in the field.

The battle of *Fontenoy* was on the 11th, on which day the weather was fair, and the following night was so dry and warm, that though most of the men lay without cover, and all had been fatigued, yet no sickness ensued. Next day an hospital was opened at *Atb* in the cazernes of *St. Roc*, which received about 600 wounded: the rest,

to

to the amount of above 1200, were carried off by the 1745. *French*.

On the 16th, the army removed from *Atb* and encamped at *Leffines*, where we continued till the 30th of *June*. The greatest part of May being dry, and moderately warm, was favourable both to the wounded and to the men in camp. But June being cold and wet, the vernal agues and fluxes returned, and though little affecting the old and hardened troops, were severe on *Price's* and *Mordaunt's* regiments, which, with the *draughts*, were new, and had encamped at *Leffines* for the first time.

From this place the army moved to *Grammont*, where they lay ten days, and from thence marching to *Brussels* encamped on the plain of *Dieghem*; which being a dry, open and elevated piece of ground, is reputed the most healthful for a camp in the *Netherlands*. From hence, after a month's stay, we moved to *Vilvorde*; where the soil being still dry, the country airy, and the weather temperate, the men continued so very healthy, that in the middle of September few battalions returned above twelve sick; which was as low a number as could be expected in the best quarters.

The mildness of the weather, the dryness of the ground, and the little fatigue which the troops underwent, concurred in making the autumn, usually a sickly season,

1745. uncommonly healthful. The dysentery had been frequent in the new regiments only, and was easily cured; nor could the remitting fever ever be called epidemic. For though it began about the end of August, and was the most frequent disease throughout the rest of the campaign, yet so inconsiderable was it, that no battalion at any time *returned* above seven or eight ill of that distemper; and those with milder symptoms than had been known in the former campaigns.

It was observable, that when the army made a small remove to form a line along the great canal, the ground being low and close-planted, the effects of moisture were immediately seen; but upon returning to our former camp, they soon disappeared.

On the 24th of October, the weather continuing fair and temperate, the camp broke up, and the troops went into winter-quarters. Some time before, ten battalions had been sent home; and in the beginning of November, the whole *British* infantry, with part of the cavalry, being recalled to suppress the rebellion, marched to *Willemstad* and embarked for *England*.

Thus far an account of the health of the main body: the state of the separate corps was as follows. In the end of August, *Ostend* having surrendered, the garrison, consisting of five battalions *British*, was conducted to *Mons*,
where

where they continued about three weeks. These men 1745. had been so healthy, that when they marched out, upon the capitulation, they left only ten sick; but the same corps being put into damp barracks at *Mons*, whilst the town itself was surrounded with an inundation, the autumnal diseases so much prevailed, that in this short time 250 were taken ill, and left behind when the rest set out for *Brussels*. The disorders were dysenteries, remitting and intermitting fevers; and to these fevers, as is usual towards the end of autumn, were joined coughs, rheumatic pains, and other effects of cold; not without some mixture of the jail-fever, produced by the close and crowded barracks at *Mons*.

Handyside's regiment, another detached corps, came over this summer for the first time, and about the middle of July was put into the citadel of *Antwerp*. The air of that city is moist; the fort in particular is exposed to the exhalations of the adjacent marshes; and the barracks were on ground floors and very damp. In consequence of this, the dysentery, with remitting and intermitting fevers of a bad kind, became general among these men. In the beginning of October the sick of this battalion amounted to 163, a number five or six times greater than there was in any other corps then in the field. Such a disproportion seemed only to be owing to a greater degree of moisture; since the other new regiments, that were then in camp, suffered little; and in the town of *Antwerp*, fluxes, remitting

1745. remitting and intermitting fevers were also frequent among the inhabitants, whilst the people of *Brussels* enjoyed perfect health. And when *Ghent* was taken, part of *Rich's* dragoons having escaped from thence and returned to *Antwerp*, were seized with the epidemic diseases of that place; whilst the rest of the regiment, which lay in camp, continued free both from the fevers and the flux.

Upon the whole, when the campaign ended, we had in the hospitals at *Antwerp*, *Brussels* and *Mons* only about 1000 sick: a small number, when we consider that during this summer there had been in *Flanders*, besides the cavalry, 29 battalions, whereof some had never been in the field before. From the beginning to the end of the campaign, exclusive of those who were killed in battle, or died of their wounds, the deaths did not exceed 200. The moderate heats, the dryness of the grounds for encampment, the little fatigue, and little exposition to wet and damps on marches or other duty, and the early return to winter quarters, were circumstances tending to make this, of the whole war, the most healthful campaign.

CHAP. VI.

A general account of the diseases of the campaign in Great Britain, 1745 and 1746.

TOWARDS the end of the campaign 1745, the three bat- 1745.
talions of foot-guards, and seven others, embarked in *Holland* and landed in the south of *England*. The passage was short, and the troops leaving the field before the nights grew cold arrived in perfect health. The rest of the infantry, having lain longer in camp, embarked later in the season; and being detained long on board by contrary winds, came sickly to *Newcastle*, *Holy-island* and *Berwick*. For some of the men, during the voyage, being taken ill of the remitting fever, this fever, by the crowds and the confined air of the hold, was soon converted into the jail-fever, and became infectious.

At *Newcastle*, an hospital was made for the sick that landed there; and the houses taken for that purpose, receiving also those who fell ill in the army commanded by Marshal *Wade*, were so much crowded, that the air was soon corrupted. The disease became so infectious, that the nurses and most of the medical attendants were seized with it; insomuch that three of the apothecaries of that place, with four of their apprentices and two journeymen employed in the hospital, died of it.

Ligonier's

1745. *Ligonier's* and *Price's* regiments landed at *Holy-island*. Both had embarked in good health, after leaving their sick at *Antwerp*; but by the time they arrived, they were in no better condition than those who came to *Newcastle*. Their distress was unforeseen and unprovided for. Ninety-seven were taken out of the ships ill of the jail-fever, whereof forty died; and the people of the place receiving the infection, in a few weeks buried fifty, the sixth part of the inhabitants of that island. The same fever was carried into *Berwick* by the soldiers who landed there; but the sick being fewer, the distemper did not spread.

In the beginning of December, a body of troops, consisting of 12 battalions and 3 regiments of cavalry, under the command of his Royal Highness the Duke, assembled at *Litchfield*. The *Quakers* had made a present of flannel under-waistcoats to the soldiers, which was a seasonable provision for a winter campaign. The march was dry; the army encamped at *Packington* for three days only; at *Stone*, the men lay for one night upon their arms: but at all other times lying in houses, and having plenty of straw, fuel and provisions, they were more healthy than could be expected in a campaign at that time of the year.

Towards the end of December, most of the infantry were sent into quarters, whilst the cavalry and 1000 foot
advanced

advanced to *Carlisle*. The few who fell ill on the march 1745. were left in the towns on the road to the care of the country surgeons, and were well treated.

But the troops having continued several days at *Litchfield*, a greater number of sick was left in that place than in any other. On this account, the work-house was fitted up for an hospital; where too many being admitted, the air was corrupted, and the common inflammatory fevers putting on a malignant form, several died. But at all other places where the soldiers were taken ill, and where there was no common hospital, this jail-fever was unknown.

The autumnal remitting fever, disguised with many symptoms of cold, could be traced in the troops that came over from *Flanders*, till the frosts in December put an end to it. But the prevailing disorders were hard coughs, fits, pleuritic and rheumatic pains, with a few fluxes, the natural consequences of the men being exposed to colds and rains on duty, or wet feet on the march. There were some intermittents besides, but all with such a mixture of coughs and infarctions of the lungs, as made bleeding the most necessary remedy. In general, bleeding was so requisite, that in every town through which the troops past, and where the sick were to be left behind, the physician of the army believed the surgeons and apothecaries

1746. carries of the place more than half instructed about the cure of the patients committed to them, when he had inculcated the necessity of large and repeated bleedings: for the men were at this time well fed, and from taking cold, their blood was soon inflamed.

Carlisle was invested in the beginning of January, and taken in a few days. The shortness of the time, the mildness of the weather for the season, and the good cover which the troops found near the works, made the sickness so inconsiderable that only one man died there. And during the whole expedition this Body did not lose above 40 men, though there had been in all between 600 and 700 ill.

On the 10th of February, the army, under the command of his Royal Highness the Duke, marched from *Edinburgh* for *Perth*. It consisted of 14 battalions and three regiments of cavalry, which being too large a number to be all billeted in the private houses of that town, two battalions were quartered in the churches. Provisions were in plenty, but the quarters were generally cold; so that many fell ill of the common inflammatory disorders of winter. The hard coughs, in particular, with pleuritis and peripneumonies were most frequent.

In the beginning of March, the troops advanced from *Perth* to *Montrose*, and from thence to *Aberdeen*, leaving 300
sick

sick behind, who were well accommodated in the corporation-halls, or in the private houses of those towns. 1746.

Till the end of March, the whole infantry was quartered in *Aberdeen*; but afterwards nine battalions were cantoned at *Inverurie* and *Strathbogie*; and at this time, one battalion more landed at *Aberdeen* and joined the army.

The weather being all this time sharp, with frost, snow, and easterly winds, the inflammatory diseases continued. But whilst the men suffered by cold beds, guards, and out-duties, or by their own mismanagement, the officers escaped, having warm quarters, and being less exposed to cold: only in the beginning of March, when the weather was very cold, a few were seized with the gout.

The sick were well lodged in the town-hospital and in other large houses, where having a free air, they were preserved from the hospital-fever. Including those at *Inverurie* and *Strathbogie*, about 400 sick were left behind when the army moved; but of this number a small proportion died.

On the 23d of April, the army first encamped at *Cullen*; the next day, we passed the *Spey*; and on the 17th, after the battle of *Culloden*, we advanced to *Inverness*, and encamped on the south side of the town.

1746. At *Strathbogie* and *Inverurie*, the duty had been constant to guard against a surprize; one day's march had been long and rainy, the encampment early, and colds caught by wading the rivers: all these circumstances concurred to make the sickness considerable. Before we reached *Inverness*, about 70 men fell sick, and were left in towns by the way. After taking the field, the inflammatory diseases still increased, and were the more severe, as the climate was cold, and the camp exposed in an open country to piercing winds. The pleurifies and peripneumonies were particularly violent, and tended quickly to suppuration.

At *Inverness*, two malt-barns received the wounded; in all 270. There were several who had cuts of the broadsword, till then uncommon wounds in our hospitals; but these were easily healed, as the openings were large in proportion to the depth, as they bled much at first, and as there were no contusions and eschars, as in gun-shot wounds, to obstruct a good digestion.

Besides these barns, two well aired houses were prepared for the sick. The regimental surgeons had also orders to provide quarters for their men when they were taken ill, with the liberty of sending to the general hospital such a proportion of the worst cases as would not crowd it. By this dispersion of the sick, and the preservation

1746.
fervation of a pure air in the wards, it was hoped that any contagion might be moderated, if not prevented; though it was more than ever to be apprehended, from the smallness of the town, the jails filled with prisoners, many of them wounded, the prospect of a long encampment and camp-diseases, the crouds and filth of a place where the markets of an army were kept; and lastly, a morbid state of air, from the measles and small-pox which had prevailed in the town before the arrival of the army.

All these circumstances concurred to put us more upon our guard, and therefore the greater care was taken to divide the sick, and to keep the wards clean. An order was likewise given to clean the jails every day, to remove speedily the bodies of those who died in them; and to lessen the croud, part of the prisoners were sent on board some ships that were lying in the road, with a liberty of coming upon deck for the air.

In this manner the month of May passed without any infection; and the weather, for the climate, being unusually dry and warm, the inflammatory sickness in the camp had visibly declined, when an unforeseen accident rendered the malignant fever more general and fatal than had been at first apprehended. For, about the end of that month, *Houghton's* regiment, which with three more had been

1746. been sent as a reinforcement, landed at *Nairn* and joined the army. A few days after, twelve men of that corps were sent to the hospital with fevers, and were bled largely upon admission. But next day, not observing the coughs, stitches, and rheumatic pains, the common symptoms of the fever at that time prevailing in the camp, and finding that the bleeding had sunk the pulse, and that some had an uncommon *stupor*, the physician immediately referred this fever to the malignant kind; concluding it had taken its rise from the confinement and bad air in the ships during the voyage; yet he thought it strange, that this battalion, and none of the rest who sailed with it should be so sickly.

But upon further enquiry, he was informed that this fever came directly by contagion from the true jail-distemper, communicated in the following manner. Not long before, a *French* ship had been taken on the coast of *England*, on board of which some troops had been sent to assist the rebels, and amongst them a few *English* soldiers, who in *Flanders* had gone over to the enemy. These deserters upon being taken were thrown into jails in *England*, where they were kept till an opportunity offered of sending them by the transports to be tried by a court-martial at *Inverness*. They were in all 36, and having brought with them the jail-fever gave it to this battalion with which they happened to be embarked.

In

In three days after coming on shore, six of the officers 1746. were seized with it, and the regiment, in the few days they were quartered at *Nairn*, left about 80 sick; in the ten following, while in camp at *Inverness*, they sent to the hospital about 120 ill of the same fever: and though the virulence of the distemper diminished afterwards in their march to *Fort-Augustus*, and from thence to *Fort-William*, yet that corps remained for some time very sickly.

The symptoms of the jail-fever were in every point so like those of the hospital-fever, that, as they were formerly only conjectured to be the same distemper, they were now proved to be so really. Being thus introduced, it soon spread, not only in the hospitals but among the inhabitants of the town, whilst the ordinary camp-diseases, after the beginning of May, sensibly declined both in violence and number. The weather being all the month of May not only dry, but warm for the climate, the camp at this time was subject to no other diseases than such as always attend the beginning of a campaign; except that there were fewer agues, and more diarrhœas. For, a looseness accompanied most of the disorders, but was slight, and seemed not to be so much the effect of colds as of the river-water, which comes out of *Loch-Ness*, and has generally been accounted laxative to people unaccustomed to it. This looseness ceased without medicines, or soon yielded to astringents.

1746. On the 3d of June, four battalions were left at *Inverness*, and nine, with a regiment of horse, marched to *Fort-Augustus*; leaving in the hospital about 600 sick, besides the wounded.

The new encampment was close by the fort at the end of *Loch-Nefs*, in a valley furrounded by mountains, except where it opens upon the lake. This lake is a large body of fresh water, twenty-four miles in length, somewhat more than a mile broad, lying between two parallel and straight ridges of mountains, and affording the prospect of a vast canal. It is curious on account of its great depth, and its never freezing. The common soundings are from 116 to 120 fathoms, and in one place they run to 135. The water is perfectly soft and sweet, and readily bears soap; yet to some it proves laxative, and is generally diuretic. The people of the country recommend it for the scurvy; and indeed from these qualities there is reason to believe it may be proper in some *species* of that distemper*. A great many small but heavy stones, of the marcasite kind, are found upon the beach; and it is not improbable that the bottom may be covered with the like. But whether the water is preserved from freezing by some mineral prin-

* *Viz.* In scurfs, tetters, and lesser degrees of the *lepra*, which are commonly, but improperly, supposed to proceed from a scorbutic humour. *Vid.* part iii. ch. vii.

ciple, by its vast depth, or by some hot springs, has not been determined *. As it is stored with large and good fish, and is without any particular taste, it should seem to be little, if at all, impregnated with any mineral. And besides being always cool, there is the less reason to suppose any hot springs at the bottom, as none of that kind are found any where else in the country. The lake is fed by several small rivers which are liable to have ice, and empties itself by the *Nefs*, a large clear river, which after a course of six miles runs into the *Frith* of *Murray* at *Inverness*, and, like its source, is never known to freeze. 1746.

Fort-Augustus has always been a healthy garrison; but *Fort-William*, which lies towards the west coast, at the distance of 28 miles from the other, has ever been sickly, and in particular productive of agues and the bloody-

* It is most probable, that the not freezing of this lake is owing to its great depth. For Count MARSILLI observes (*Hist. Phys. de la Mer*) that the sea, from 10 to 120 fathoms, is of the same degree of heat from December to the beginning of April, and he conjectures that it remains so for the rest of the year with little variation. Now, it is reasonable to believe, that the great depths in fresh water will be little more affected, than those of the sea, with the heat and coldness of the air; and therefore that the surface of *Loch-Nefs* may be kept from freezing by the vast body of water underneath, of a degree of heat considerably greater than that of the freezing point. Another circumstance may concur: there is never any perfect calm on the lake, and the wind blowing always from one end to the other, makes such an undulation as must very much obstruct the freezing of the water. This account seems to be confirmed by an observation commonly made in the neighbourhood, which is, that when the water is taken out of the lake and kept without motion, it then freezes as soon as any other.

H

flux.

1746. flux. On the west coast there are continual rains, and the fort stands in a narrow and moist valley furrounded by mountains; so that there is not only a greater fall of rain, but a slower evaporation in that part than in any other of the country.

There being no straw at *Fort-Augustus*, the men were ordered to cut the heath for bedding; and it was observable, that such as were most careful in providing themselves with a due quantity, and renewing it often, were least sickly.

The weather, for the last half of May and beginning of June, had been uncommonly dry and warm, but afterwards it grew cold and rainy. Upon this change, the dysentery began to be more frequent; but there being constant winds, which kept the ground tolerably dry, the increase of the distemper by contagion seemed to be thereby prevented.

The flux, and every other disease of this encampment, being attended with fizy blood and other marks of inflammation, we found that large and repeated bleedings were more necessary here than in a warmer climate. But vomits were not so efficacious as they had been abroad, though at this time they were of more service than in the spring; as if, even in this latitude, some degree of corruption in the humours could be traced in the summer.

Besides

Besides the dysentery, there were fluxes of a milder 1746.
kind among the soldiers, proceeding either from errors in
diet, wet feet, or wet clothes; or accompanying fevers,
when, from the want of sufficient covering, the sick could
not freely perspire.

The inflammatory fevers, in proportion as the summer
advanced, appeared with less violent symptoms, and un-
less from extraordinary expositions to cold, had not so
often the form of a peripneumony, pleurisy, acute rheu-
matism, or the like, but were chiefly distinguishable by
the viscosity of the blood.

The intermittents partook both of a putrid and inflam-
matory nature, and therefore required both bleeding and
evacuations of the *primæ viæ*. But they were not nume-
rous; as the constant winds prevented a stagnation of the
air, and soon dried the ground after rain.

In this camp, we had no other accommodation for the
sick than a few huts in the neighbourhood: apprehending
therefore bad air, we sent as many as could be
transported to *Inverness*; and by this precaution the
hospital-fever was retarded but not prevented. For when
the sick multiplied, these infirmary-huts were soon crowd-
ed, the air was vitiated, the hospital fever broke out
and became fatal; and when joined to any common in-
flammatory disorder, a mixture of the two arose which

1746. produced some perplexing cases, from the indications of cure being so contradictory.

In the middle of August, the camp broke up, leaving at *Fort-Augustus* between 300 and 400 sick, who were afterwards carried to *Inverness*. By this time the hospital-fever was frequent among the inhabitants of that town; but was milder than usual, from the coolness of the weather, and the open situation of the place.

From the middle of February, when the army crossed the *Forth*, to the end of the campaign, there had been in hospitals upwards of 2000 men, including the wounded; of which number near 300 died, and principally of this malignant fever.

C H A P. VII.

A general account of the diseases of the campaigns in Dutch Brabant, in the years 1746 and 1747.

1746. **T**HIS was the state of the health of the troops in *Britain*. In the *Low-Countries*, from the beginning of this campaign, there had been only three battalions and nine squadrons *British*. In August, four battalions were sent from *Scotland* to join the army, which landing at *Willemstad*, and remaining some time in that low and marshy ground,

ground, during the height of the sickly season, were soon 1746.
afflicted with the remitting and intermitting fevers of the
country, and before they marched, were obliged to send
many to the hospital at *Oosterhout*.

The campaign abroad being attended with several fatiguing and wet marches in autumn, after a hot summer, and continuing late, proved very sickly. For at breaking up, exclusive of the wounded from the battle of *Rocoux*, about 1500 of our men were in hospitals, which made at that time nearly a fourth part of our whole number. But there was nothing uncommon in the diseases, being such as regularly occur in the course of every campaign *.

In the ensuing spring, 1747, the army took the field on 1747.
the 23d of April, encamping first at *Gilsen* near *Breda*. The
British consisted at first of 15 battalions and 14 squadrons,
and some time after, seven battalions more arrived from
England; but four of these being employed in *Zealand*, and
three in the lines of *Bergen-op-Zoom*, these seven never
joined the army.

The first days of the encampment were cold, then the
weather grew mild, and continued so till the beginning
of June, when it became hot. From taking the field, till

* As the author attended the army in *Scotland* during this campaign, he could not give a more particular account of the diseases of the troops employed in the *Low-Countries*.

towards

1747. towards the end of June, there was little rain, and all the camp-grounds were dry.

In the first six weeks, about 250 were sent into hospitals; a moderate number, considering how early the troops had left their quarters. The distempers took their usual course, that is, were mostly inflammatory.

The battle of *Laffeld* was on the 2d of July, and from about that time till towards the end of the month, there fell a good deal of rain which cooled the air. About 800 wounded were brought into *Maestricht*, where, among other places, a large church was employed for an hospital: this not only held a considerable number, but by its spaciousness prevented the hospital-fever; though many lay in it, during the season, who were ill of fluxes and other putrid diseases.

After the battle, the army crossed the *Maes* and encamped at *Richolt*. In a few days we moved to *Richel*, and afterwards to *Argenteau*, still keeping in the neighbourhood of *Maestricht*. The situation of these camps was dry and airy, and there being at first no extraordinary night-duty, the distempers were few and but little inflammatory. The dysentery did not as yet appear, unless among the guards, which, at *Richolt*, encamped on a low ground then a little wet with the rains; but the cases were few, and the symptoms mild.

From

From the 20th of July till the 10th of September, the 1747. weather was sultry, and till the middle of August the nights were nearly as hot as the days. During all that time the camp was healthy, but the wounded suffered; for the great heat either brought on slow fevers, or by relaxing the fibres and rendering the humours acrid, sometimes kept the wounds from closing, and at other times disposed them, when healed, to break out afresh. About the middle of August, though the days were still hot, yet the nights began to grow cool, and the dews to fall; and from these interchanges, to which the men in camp were most exposed, the dysentery took its rise; as it usually happens upon the perspiration being checked by cold and damps, after the humours have become acrid by continued heats.

Above half the foldiers had the distemper more or less, and it was also more frequent among the officers than had been hitherto known. The contagion ran through the neighbouring villages, and was mortal among the peasants, who either wanted medicine altogether, or used what they had better been without. But *Maestricht* suffered little, though it had a constant intercourse with the camp; for this town standing on a large river, in an open country, is well aired and very clean.

Notwithstanding the violence and frequency of the flux, few of our people died of it; for the sick were more dispersed,

1747. perfed, the hospitals were better aired than ufual, and the regimental furgeons having been taught by experience, either cured the men in their field-hospitals, or made fome neceffary evacuations before they fent them to the general hospital at *Maeftricht*.

In the beginning of October, we had much rain, and fuch as happened to be expofed to it, were feized with the dyfentery: but to the army in general, this rain was a favourable circumftance, as it cooled the air, and thereby foon put an end to the difeafe.

About this time the autumnal remitting fever, which had firft appeared about the end of Auguft, was frequent, but with nothing new either in the fymptoms or cure.

In a few days after the rains, the army moved towards *Breda*; and as the weather began then to be cold, coughs, pleuritic ftitches and rheumatic pains, became common, either alone or combined with the remitting fever.

On the 12th of November, all the *British* got into winter-quarters.

Although there had been much ficknefs in the great camp during the campaign, there was little mortality; and at breaking up, confidering how late in the feafon it was, the numbers fent from the main body into the hospital were moderate.

But

But in *Zealand*, the sickness was great among the four 1747. battalions which had continued there since the beginning of the campaign. These men, partly in camp, and partly in cantonments, lay in *South-Beveland* and in the island of *Walcheren*, two districts of that province, and both in the field and in quarters were so very sickly, that at the height of the epidemic some of these corps had but 100 men fit for duty; which was less than the seventh part of a complete battalion. The *Royal*, in particular, at the end of the campaign, had but four men that never had been ill. Now, the nature of the air in *Zealand*, and its effects in producing remitting and intermitting fevers and fluxes having been already shewn, it will be sufficient to refer to that place for a general account of those distempers*; and for a more particular one, to the third part of this work†. I shall only observe here, that the epidemic fever, by reason of the great heats of the season, not only began more early in *Zealand* than usual, but was more severe, and fully as fatal to the natives as to us. Our officers there were also sickly; though by more timely and greater care, their fevers were attended with less ardent and malignant symptoms than those among the common men. But Commodore *Mitchel's* squadron, which lay all this time at anchor in the channel between *South-Beveland* and the island of *Walcheren*, in both which places the distemper raged, was neither afflicted with the fever nor the

* Chap. i.

† Chap. iv. § 2.

1747. flux, but amidst all that sickness enjoyed perfect health; a proof, that the moist and putrid air of the marshes was dissipated, or corrected, before it could reach them; and, that a situation open to the wind is one of the best preservatives against the diseases of a neighbouring low and marshy country.

In proportion as the autumn grew cool, the fever abated of its ardour, and changed more easily into an intermittent; though irregular, and of a bad kind. The dysentery was never general, but not uncommon; and it was observable, that those who were seized with it, usually escaped the fever; or, if any man had both, it was alternately; so that when the flux began, his fever ceased, and when the former was stopped, the other returned: hence it appeared, that though the two distempers were of a very different form, yet they proceeded from a like cause.

As to the three other battalions which were sent to *Bergen-op-Zoom*, they encamped in the lines of that place, and remained there during the campaign. The town itself stands on a small eminence, but the country around being in some parts marshy, the air, though not so moist as in *Zealand*, was less dry than about *Maestricht*. The sickness was in the same proportion, being, both in kind and violence, of a middle degree between what prevailed in these two places; that is, the fevers were as much below the
rage

rage of those in *Zealand*, as they were above the mildness 1747.
of the remitting ones of the great camp. And if the dysentery was more frequent in the lines of *Bergen-op-Zoom* than in *Zealand*, the reason was, that the men in the lines, doing more duty, were oftner exposed to rain, and, by being in a fixed camp, had the distemper more by contagion.

At the end of the campaign, we had in hospitals, from the main body of the *British* troops and all detachments, exclusive of the wounded, above 4000, which was something more than a fifth part of our whole number. But it is to be remarked, that the four *Zealand* battalions furnished near the half; so that when those corps went into winter-quarters, their sick in proportion to their men fit for duty were nearly as four to one.

C H A P. VIII.

A general account of the diseases of the campaign in Dutch Brabant, in the year 1748.

THIS campaign, which was the last, opened early. 1748.
For, upon the 8th of April, the army encamped at *Hillenraet* near *Roermond* with 15 battalions and 14 squadrons *British*. From the time of our taking the field till

1748. the beginning of May, the weather was cold, with some snow, high winds, and rain; but the duty was easy, and the ground naturally dry.

On the 12th of May, the army left *Hillenraet*, and in a few days came to *Nistelroy*, where we encamped for the last time, leaving in the hospital at *Cuick* about 500, and those, as usual, mostly ill of inflammatory diseases. There was indeed an uncommon proportion of intermittents, which were not all recent cases, but for the most part relapses in such as, during the preceding campaign, had been seized with fevers in *Zealand*, or in the lines of *Bergen-op-Zoom*. These relapses were also, from the coldness of the season, attended with some degree of inflammation.

In this camp the *British* were augmented by seven battalions from *England*.

The weather was now warm, and the days often hot; but some seasonable rains, with thunder and lightning, seemed to prevent any sultry heats, and to purify the air of what was most insalutary. For, it has been remarked of thunder, that as it is most frequent in close and marshy countries, it may have for a final cause the cooling the air, and correcting the putrescency of the vapours in it when the heats are most intemperate *.

* Vid. MUSSCHENBROEK *Instit. Phys.* cap. xl.

The ground was also dry, and the camp airy ; so that the 1748.
sickness was inconsiderable while the troops kept the
field.

From this good state of health, the four battalions which
had been in *Zealand* the last campaign were an exception, as
being subject to relapse into irregular agues terminating
in dropries. So that their sick being numerous, and crowd-
ing the regimental infirmaries (which were in the cot-
tages near the line) they soon bred a malignant fever,
which they carried to the general hospital at *Ravenstein*.
But there, the wards being spacious and well aired, though
several of the sick were brought in with petechial spots,
the contagion spread no farther.

On the 9th of July, the camp broke up and the troops
went into cantonments. The head-quarters were at *Eynd-
hoven*, with the three battalions of guards ; the rest of the
foot were quartered in the adjacent villages, and the ca-
valry near *Bois-le-duc*.

At this time, we had only about 1000 in all the hospi-
tals, including such as had remained from the last winter
and the preceding campaign ; but, in a few days after
leaving the field, a fever appeared, which soon became
as frequent as any that had hitherto afflicted the army.
It was thus accounted for :

This

1748. This part of *Brabant* is nearly as flat as any of the *Netherlands*; the only inequalities being some sand-hills and insensible risings which give the advantage of a few feet in height to some of the villages. The soil is a barren sand, and so little water is seen, that at first sight the country might seem to be dry and healthful. But the appearance is deceitful; for, water is every where to be found at the depth of two or three feet; and, in proportion to its distance from the surface, the inhabitants are free from diseases. The country bordering upon the lower part of the *Maes* is not only unhealthful on this account, but, by reason of floods from the smaller rivers, lies all the winter under water, and continues damp throughout the summer. The moisture and corruption of the air were much increased by the inundations which had been made about the fortified towns since the commencement of the war, and sensibly became more noxious upon letting off part of the water, in the beginning of summer, after the preliminary articles of the peace were signed. For these grounds, which were once intirely covered, being now half drained and marshy, filled the air with moist and putrid exhalations. The *States of Holland* being made sensible of this, by the sickness which raged at *Breda* and in the neighbouring villages, gave orders to let in the water again, and to keep it up till winter.

This sickness was much greater near *Breda* and *Bois-le-duc*, than at *Eyndhoven* which lay at a much greater distance
from

from the inundations and from other marshy grounds. 1748. The moisture therefore in most of the cantonments arose principally from the subterraneous water which exhaled through the sand *. There were two villages near *Eyndhoven*, called *Lind* and *Zelft*, the one ten, and the other fourteen feet above the surface of the water (an extraordinary height in that country) and it was observable, how much better the soldiers kept their health in both these places, than in any other of the cantonments.

At *Eyndhoven*, two battalions of the guards were quartered in the town; and the third, in the peasants houses in the country; all within the compass of a mile; yet, it was remarkable, that the battalion which lay out of the town had always three times more in the *returns* than either of the other two, though one of them had been sickly the year before in *Zealand*. Now, the height of the ground being alike to all, the difference in point of health could be ascribed to nothing but to the greater moisture of the cottages †; for, in other respects, these corps were equal, *viz.* as to diet, duty, and exercise. A similar case occurred in the cantonment of a regiment of foot, whereof one company being quartered in houses that stood upon a heath enjoyed a tolerable degree of health, while the rest, that dwelt in a wood, were very sickly. And, as a further proof how prejudicial it is to confine the air by

* See chap. i. p. 2.

† See chap. i. p. 4.

plantations,

1748. plantations, in a moist country, it was observable, that the *Dutch* camp at *Gilsen*, bordering on our cantonments, but lying upon an open heath, preserved a good share of health while we were at the worst.

Thus far an account of our situation; we shall next see how much the weather concurred in forming this epidemic.

The summer had been hitherto warm, but throughout July and August, whilst the sickness was greatest, the weather was fair, close and sultry. Near the inundations, the nocturnal fogs were thick and fetid. The heats abated in the beginning of September, and the distempers in proportion; but till the 20th of October, the season was never cold. About that time, we had some days of rain and high winds, and, towards the end of the month, some nights of hard frost; then the weather grew milder, and continued so while the troops remained in that country.

The first and worst appearance of the epidemic was in the form of an ardent fever. The men were suddenly seized with a violent head-ach, and frequently with a *delirium*. If sensible, they complained also of grievous pains in their back and loins, of intense thirst, and a burning heat, with sickness and oppression at the stomach, or with retchings, and vomiting of bile. Others had an evacuation of the bile by stool, with a *teneismus*, and pains in the bowels.

bowels. This fever generally remitted from the beginning, especially upon bleeding and evacuations of the *prime vie*; but if these precautions were omitted, the disease went on in almost a continued form. Such was the tendency to putrefaction, that some had spots and blotches, and even mortifications almost always fatal. 1748.

With these and such other symptoms most of the cases were accompanied, during the first rage of the distemper, in the cantonments next to the inundations; but those who lay farther from the water, and were only annoyed with the natural moisture of the country and the heat of the season, had both fewer and milder fevers.

Thus, though the sickness was general, those who were near the marshes suffered by far the most, both in number and violence of the symptoms. The *Greys*, cantoned at *Vucht* (a village within a league of *Bois-le-duc*, surrounded with meadows either then under water or but lately drained) were the most sickly. For the first fortnight, none were ill; but after continuing five weeks in that situation, they *returned* at one time 150; after two months, 260, which was above half the regiment; and at the end of the campaign, they had in all but 30 men who had never been ill. *Rothes's* and *Rich's* dragoons, who also lay near the inundation, were likewise very sickly. *Johnson's* regiment of foot at *Nieuland*, where the meadows had been floated all winter and were but just drained, *returned* some-

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times

1748. times above half their number. And the *Scotch Fuzileers* at *Dinther*, though lying at a greater distance from the inundations, yet being quartered in a low and moist village, had above 300 ill at one time. But it was remarkable, that a regiment of dragoons cantoned at *Helvoirt* (a village lying only half a league south-west of *Vucht*) were in a good measure exempted from the distresses of their neighbours, having remitting and intermitting fevers of a more favourable kind, and in a much smaller number. Such was the advantage of that distance from the marshes, of the wind blowing mostly from the dry grounds, and of a situation somewhat higher than the rest upon an open heath.

Thus the troops had scarce been a month in the cantonments when the *returns* of the whole were increased by two thousand, and afterwards, they rose much higher. For the sickness continued throughout August, and only abated with the heats, in the middle of September. Then indeed the fevers began to decrease in number as well as violence, the remissions were also more free; so that insensibly, with the coolness of the weather, this raging fever dwindled into a regular intermittent, and intirely ceased upon the approach of winter. It was curious to observe how these agues declined proportionally to the withering and fall of the leaf. At that time less moisture ascends, and by the shedding of the leaves, the villages become

become more open and perflated, and of course more dry and healthful. 1748.

Throughout all the cantonments the officers were much less sickly than the common men; an advantage they owed to good beds, dry rooms, and a better diet.

The peasants were great sufferers, particularly those near *Breda* and *Bois-le-duc*; but in the towns, there was less sickness, and fewer in proportion died *. In general, the fever was most frequent among the poorer sort, who lay on ground-floors, fared ill, and wanted medicine: for without artificial evacuations, nature was able either to make no cures, or but slow and imperfect ones. This country had not known such distress for a number of years; as two such causes had not concurred; I mean the inundations, with a hot and close summer and autumn.

All this while the dysentery was little frequent; a circumstance which seems to require some attention, when one considers the corruption of the humours, and their disposition to affect the intestines. It may be remembered, that the flux was said to appear, when after great heats the perspiration was suddenly stopped by wet clothes, wet ground, or night-fogs and dews; but these, though common occurrences in a camp, are rare in quarters. Add, that the spreading of the dysentery is not owing so directly to the season, wet clothes, or other accidents, as

* This is accounted for, page 4.

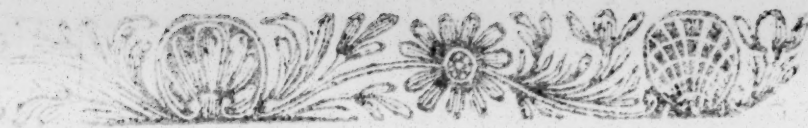
1748. to the contagion arising from the putrid excrements of those that happen to fall first ill of that distemper. Now, in the cantonments, the men were not only less liable to have their clothes wet, but when any were really taken ill from such a cause, they were so much dispersed, that their excrements could not spread the infection.

About the middle of November, the peace being concluded, the troops moved from their cantonments to *Willemstad*, and there embarked for *England*; but the wind being contrary, several of the ships lay above a month at anchor, and, after all, meeting with a tedious and stormy passage (during which the men kept mostly below deck) the air was corrupted, and produced the jail or hospital-fever.

This distemper was worst in the ships which transported the sick from the general hospital at *Oosterhout* to *Ipswich*; for, from some seeds of the disease already among them, but chiefly from the men being crowded in the hold, where they were confined for three weeks, most of them were seized with this fever either on board or soon after they landed. It was observable, that the greatest number and the worst cases were in one of the ships, in which there happened to lie two men with mortified limbs; which accident was not only the means of spreading the infection at sea, but also in the wards in which they lay after coming ashore.

The hospital, prepared at *Ipswich* for the reception of the 1748. sick from *Oosterhout* only, was obliged to admit several more from the other transports which by stress of weather put in on that coast; so that in all, we had about 400, and most of them ill of this malignant fever. As so many were brought from the hospital-ships in the last extremity, the infection and mortality were at first considerable; but by the largeness of the wards, and by billeting in the town every man as soon as he recovered (thereby removing him from new contagion and gaining more room for those who were still sick) the air was daily purified, and the distemper abated sooner than could have been expected. The hospital then broke up after it had continued about three months in *England*.





REPORT
ON THE
ISSUES OF THE ARMY

I In the first place, more frequent
in the course of the year, for the
reasons, for the cause, and for the
shall have too much to do, and that
were proper to be put in the hands of
for different parts of the work, and that in order to
ceed in this

- I To divide the duties into their several classes
- II To improve and the duties as far as they depend
upon the art, and order of the establishment
- III To propose some means of prevention



O B S E R V A T I O N S
O N T H E
D I S E A S E S O F T H E A R M Y.

P A R T II.

IN the first part, I have given a general account of the more frequent diseases of the army as they occurred in the course of the war. But for particular descriptions, for the causes, preservatives, and cures, since they must have too much interrupted the series of facts that were proper to be presented in one view, I reserved them for different parts of this work, and shall therefore proceed in this,

I. To divide the diseases into their several classes.

II. To inquire into the causes, as far as they depend upon the air, diet, and other of the *non-naturals*.

III. To propose some means of prevention.

IV. To

IV. To compare the seasons, with regard to health and sickness, in order to compute what number of men may be relied on for service at different times of the year.

C H A P. I.

Of the division of the diseases most incident to an army.

THE circumstances of soldiers, in time of war, are different from those of other people, in their being more exposed to the injuries of the weather, and always crowded together in camps, barracks, and hospitals: therefore the most general division of their distempers may be, into such as arise from the intemperance of the weather, from bad air, and from infection.

Military diseases depending on the weather are reducible to two sorts, *viz.* to those of *summer*, and to those of *winter*: or, which is the same, to those of the *camp*, and to those of *garrisons*. But as expositions to cold are unavoidable upon the first encampment, as also for some time before an army usually leaves the field, the winter diseases, beginning about the end of Autumn, do not intirely cease before the summer is well advanced; and on the other hand, as the heats of summer and the damps of autumn dispose the body to sickness, the camp-disorders do not cease intirely, but continue some time after the troops
return

return into winter-quarters : so that whenever we mention diseases as belonging to summer, or winter, to the camp, or garrison, they are always to be understood as protracted in this manner.

If the more general diseases of an army are not to be defined by the seasons, but by the state of the body that accompanies them, we may divide them into the *inflammatory*, and the *bilious* or *putrid*; the inflammatory being the same with those of winter, and of the first encampment; and the bilious or putrid, the same with those of the summer and autumn, and with part of those which are carried from the field into the garrisons.

The most frequent winter or inflammatory disorders are coughs, pleurifies, peripneumonies, acute rheumatisms, inflammations of the brain, of the bowels, and of other parts, attended with a fever; lesser inflammations with little fever; and fevers of an inflammatory kind, where no part is so sensibly affected as to give a name to the disease. To the same class may also be referred such of the chronic ailments as arise from inflammations, whereof the chief are old coughs, consumptions, and the rheumatism without fever. Now all these distempers come originally from colds, which are supposed to occasion a suppression of perspiration at a time when the fibres are most braced, the blood condensed, and the pores of the skin and lungs most contracted.

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But

But the diseases of summer and autumn are of a different nature. During these seasons the fibres are relaxed, the fluids are more rarified and disposed to putrefaction; in which state, if any stoppage happen to perspiration, or to any of the excretions designed to carry off the more volatile or putrid parts of the blood, a fever is raised, which, according to the seat of the humours, their acrimony, or the vent given them, appears in the form of a remitting, or intermitting fever, a *cholera*, or a dysentery. *Hippocrates* ascribed distempers of this nature to a redundancy of the bile; and most other authors, to a corruption of that humour; so that these summer and autumnal epidemics have been both early and generally called *bilious**. In effect, in all hot countries, and in camps, where men are so much exposed to the sun, the gall, if not more abundant, is at this time more disposed to corruption than usual; and this circumstance, though probably not the first cause of the fever, yet seems to be the attendant of most of the summer and autumnal disorders, and concurs to make them worse.

But when the same causes operate more slowly, or when the diseases last mentioned are but imperfectly cured, the *viscera* may be obstructed, or affected in such a manner as to give rise to various chronic complaints: so that considering not only the variety, but the frequency of distem-

* *Putrid* would be more proper, but I have retained the ancient term *bilious*.

pers appearing at this time, we shall find the ancient maxim that held, "the summer and autumn to be the most sickly seasons" *, not only verified with respect to the warmer climates, but also to a camp, where men are so much exposed to heat and moisture, the great cause of putrid and contagious diseases.

Having laid down this general distinction between the summer and winter disorders, it may be proper to distinguish the parts of both these seasons, in order to see their influence upon the health, according as either is more or less advanced. When the winter begins, the men being thinly clad, are subject to coughs, pleurifies, peripneumonies, and other inflammatory complaints. The same continue throughout the spring; but as the weather is then milder, the sickness is considerably less: so that this season is of all the year the most healthful to an army. But, as soon as the troops take the field, though no earlier than the first, or middle of May, by that change the winter disorders recur, with several intermittents and fluxes of an inflammatory kind. In the beginning of June, most of the inflammatory or winter diseases disappear, and what remain are of a milder nature: on this account, and because the autumnal epidemics have yet made no progress, this commonly proves the most healthful month

* *Saluberrimum ver est; proxime deinde ab hoc hyems; periculosior æstas; autumnus longe periculosissimus. CELS. (ex HIPPOCRATES.) lib. ii. cap. i.*

of the campaign. July is likewise favourable, when the summer till then has not been very hot, and when the men have not lain in wet clothes, nor on wet ground; accidents that mostly give rise to the dysentery. But in temperate years, and upon dry ground, the diseases being milder, the remitting fevers and fluxes begin only about the middle or end of August, at the time when the days are still hot, but when the cool nights bring on dews and fogs. The dysentery declines with autumn, but the remitting fevers continue as long as the encampment, and never intirely cease till the frosts begin. Lastly, towards the end of the campaign, the cold weather renews many of the inflammatory symptoms, which, sometimes by themselves, but generally combined with the remitting fever, make the first diseases of the winter.

Although this be the common course, yet we may observe, that neither the inflammatory nor the autumnal disorders are so strictly confined to their seasons, but that by various accidents they may sometimes be seen out of their place. In these matters, though there can be no speaking with precision, it is of use to know what ofteneft occurs. In the year 1746, when the troops encamped in the north of *Scotland*, the inflammatory diseases, from the coldness of the climate, continued throughout summer; and the autumnal were either not seen, or were attended with so much inflammation, that bleeding made the greatest part of the cure.

It

It is to be further remarked, that as the two seasons run insensibly into one another, there will be a mixture and confusion of the two kinds of diseases. Thus, in the end of June or beginning of July, whilst the inflammatory symptoms recede, the bilious * are advancing; so that whatever causes bring on an illness, it may be either mildly inflammatory, or bilious, or have a mixture of the two. In the same manner, towards the decline of autumn, the bilious fevers begin to have additional coughs, fits, rheumatic pains, or some other symptoms of the winter inflammations.

Lastly, it is to be observed, that the diseases of the winter, and those of the summer differ considerably as to their cure. Thus, in all winter or inflammatory disorders, the principal intentions are to diminish the force of the blood, to relax the fibres, and to make a revulsion from the parts inflamed; on which account the lancet and blisters are the chief remedies. But in summer and autumn, while the humours are in a putrescent state, and the solids too much relaxed, such medicines are most wanted as clear the first passages, correct or expel the more corrupted parts of the fluids, and brace the fibres; hence vomits, purges, acids, and the Bark are at that time of the greatest service.

* By this term, *bilious*, I would all along mean nothing more than the remitting and intermitting fevers, and the dysentery, which are commonly attended with corrupted bile, without referring the first cause of these disorders to that humour.

Thus

Thus far we may class the diseases depending upon the seasons, or the weather. It remains to consider such as proceed from foul air, and from contagion. The most fatal are the dysentery and hospital-fever, which, though arising from other causes, spread most by infection. As to the small-pox and measles, they were never general, and therefore I shall not rank them among the epidemics of an army.

The *lues venerea* and itch are infections of a different kind. The first, not being more incident to soldiers than to other men, I shall likewise pass over; but the latter, being so frequent in camps, barracks and hospitals, may be reckoned one of the military diseases; and as such shall be treated of in its proper place.

C H A P. II.

Of the causes of diseases most incident to an army.

IT appears from the first part, that the most frequent diseases of an army are owing either to the sensible changes in the air, and so have revolutions and periods like the seasons on which they depend; or to such accidents as are almost unavoidable in a military life. Wherefore it will be proper to have a thorough knowledge of
both

both these causes, in order to find out some means for preventing their worst effects.

§ I.

Of the diseases occasioned by heat, and by cold.

GREAT heats are never so much the immediate as the remoter cause of a general sickness, by relaxing the fibres and disposing the humours to putrefaction whilst the men are the whole day exposed to the sun *. This was the case in every campaign, where it was observable, that no epidemic ever ensued upon the greatest heats till the perspiration was stopped by wet clothes, wet beds, dews, or fogs, and then some bilious or putrid distemper was the consequence. In the campaign of 1743, though the weather continued long hot, yet we had no great sickness till the men lay wet after the battle of *Dettingen*, and then the dysentery immediately appeared †. Again, in the year 1747, the summer was likewise hot, but without any bad effects till towards the end of August, when

* Soldiers in a camp suffer a great deal from heat, by being constantly exposed to the sun, either without any shade at all, or only sheltered by a thin tent; and where the air being so much confined, the heat is often more insupportable than without, in the sun. This circumstance, joined to the damps of a camp, seems to be the cause that the summer and autumnal diseases of an army, even in a northern latitude, resemble so much the epidemics of southern countries, especially of those with a moist air.

† Part I. chap. iii.

the nights growing cool, the dews and night-fogs occasioning a stoppage of perspiration brought on the same distemper *. And in the last campaign, though the heats were great, yet they were the cause of little sickness till the troops were cantoned in the marshes; where a considerable degree of putrefaction and moisture being joined, the ardent, remitting, and intermitting fevers, and fluxes, were only the remoter effects of that heat †.

Nevertheless we must allow that the heats have been sometimes so great as to prove the more immediate cause of particular disorders: as when centinels were placed without cover, or frequent reliefs, in scorching heats; or when the troops marched, or were exercised in the heat of the day; or when the men imprudently lay down and fell asleep in the sun; all which circumstances were apt to bring on distempers varying according to the season. In the beginning of summer, such errors produced inflammatory fevers; and in the end of it, or in the beginning of autumn, a remitting fever, or a dysentery.

But cold is oftener the more immediate cause of diseases, and is hurtful two ways; either when pure, or attended with moisture; of which the last is the worst. The disorders arising from cold weather are all of the inflammatory kind, *viz.* coughs, pleurifies, peripneumonies, rheu-

* Part I. chap. vii.

† Part I. chap. viii.

matic pains, and the like; together with consumptions, which in the army are almost always owing to neglected colds. The mildness of our winters, and the little duty of our troops in time of peace, make expositions to cold less frequent at home. But in war, it is to be remembered what a change a soldier undergoes, from warm beds and the landlord's fire-side in *England*, to cold barracks, scanty fuel, and sharp winters in the *Netherlands*; and all this without any addition of clothes. Now, how liable our men were to take cold, was seen in the account of the first garrison-sickness, and of the diseases in the beginning and end of every campaign.

§ 2.

Of diseases occasioned by moisture.

MOISTURE is one of the most frequent causes of sickness. In the account of the diseases of the first winter, we observed how much the men suffered by damp barracks, especially at *Bruges*. The same remark was repeated in the next winter, and in the campaign of 1745. But soldiers are most liable to damps in their tents, where the air can never be thoroughly dry, by reason of a constant exhalation, and is often very moist from rains. These damps are common to all camps, and particularly to those in the lower and wetter parts of the *Netherlands*. But

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observe, that neither canals, nor even large inundations where the water is deep, are nearly so dangerous, or exhale so much noxious vapours as marshy grounds, or meadows that have been once floated and but lately drained; and that fields, though dry in appearance, may yet be moist by the transpiration of subterraneous water.

The moisture of a season is commonly estimated by the quantity of rain, whereas it depends more on the constancy of moist winds, whether they bring great rains or none at all*; but most of all upon close weather, especially in low and woody countries. In one case, rains will cause a dangerous moisture of the air, when the water stagnates and corrupts in low grounds after land-floods; but otherwise, in the flattest countries, if provided with drains, frequent summer-showers have a salutary effect, by tempering the heat, refreshing the stagnating water, and precipitating all putrid exhalations†. It is remarkable that pestilential diseases have frequently occurred in dry and hot summers‡; and agreeably to this, I have

* I made no experiments on the dryness and moisture of different winds in the *Netherlands*, but trusted to the accounts of others. MUSSCHENBROEK reckons all their northerly winds drying, but the east and north-east the dryest, and the west and south-west the moistest. *Vid. Institut. Physic. cap. xlii.* Compare Ld. BACON's *Nat. Hist. cent. viii. exp. 785.*

† Vide part I. ch. i.

‡ Vide Ld. BACON's *Nat. Hist. cent. iv. exp. 383.* DIEMERER. de *Pest. lib. I. cap. viii.* and of this work, part iii ch. iv. § 4.

observed

observed that the most sickly seasons in the field have been attended with the greatest heat, and the least rain. But it will be proper to add, that though rains in summer may be generally conducive to health, yet they will be of bad consequence when the men are obliged to march in them, or lie upon the ground whilst it is wet with them.

Cold and moist air affecting the body, in winter produced many inflammatory disorders, and relapses into such distempers as the men had been first seized with in autumn; and this effect was still more manifest in the spring and beginning of summer, upon our first taking the field.

But the consequences of moist air, after great heats of the weather and rarefaction of the blood, are more dangerous. For moisture relaxes the fibres, as well as stops perspiration; and when the humours are so much disposed to corruption by the heat, it is not surprizing that the dysentery and the bilious fever, both putrid diseases, should ensue.

The too great dryness of the air has likewise been mentioned by authors as the cause of epidemic diseases, but I imagine, without reason. For, whether in winter-quarters, or in camps, the soldiers are always exposed to too much moisture. And as for the great droughts in summer, we are never thence to infer an over-dryness

of the air; for as long as there are vegetables to perspire, the air will scarce ever want humidity sufficient for health; so that perhaps it is in the sandy deserts only we can learn what distempers are incident to men breathing in too dry an atmosphere.

§ 3.

Of diseases arising from putrid air.

I SHALL next consider how the air is changed by putrefaction, which of all other causes of sickness is the most fatal and the least understood. This bad air so hurtful to an army may be divided into four kinds: the first, arising from the corrupted water of marshes; the second, from human excrements lying about the camp, in hot weather, when the dysentery is frequent; the third, from straw rotting in the tents; and the fourth kind, is that which is breathed in hospitals crowded with men ill of putrid distempers. Of this sort also, but in a lesser degree, is the air of full barracks not kept clean; and of transport-ships, when the men have little room, and are long on board.

As to the first kind of bad air, it may be observed, that during the late war the whole army never happened to encamp so near the marshes as to receive any sensible harm thereby; but detachments have suffered from

from this cause; as one did in *Zealand*, another in the lines of *Bergen-op-Zoom* *; and in the last year of the war, a great part of the troops, being cantoned near the inundations of *Bois-le-duc*, became extremely sickly †. Now, as the exhalations from marshes do not consist of watery vapours only, but also of putrid *effluvia* arising from innumerable vegetables and insects that die and rot in them, it is no wonder that the distempers incident to those who breathe such air should be of so malignant a nature; and that bilious fevers and fluxes should be so frequent, infectious and dangerous in those countries ‡.

Next to marshes, the worst encampments are on low grounds close beset with trees; for the air is then not only moist and hurtful in itself, but by stagnating becomes more susceptible of corruption from the filth of the camp.

The second and third kinds of bad air are owing to the privies of a camp, and to rotten straw. Both these are always offensive; but while the bloody flux prevails, as they contain the putrid excrements and *effluvia* of the sick, they are then more infectious and dangerous. At certain seasons, the most healthy have some disposition to the dysentery, which might go easily off, were it not for such destructive steams which work like a ferment and ripen the distemper.

* Part i. ch. vii.

† Part i. ch. viii.

‡ Vide part i. ch. vii. and viii.

The last source is from hospitals, barracks, transport-ships, and in a word from every crowded place, where the air is so pent up as not only to lose part of its vital principle by frequent respiration, but also to be subject to corruption from the perspirable matter, which, as it is the most volatile part of the humours, is also the most putrescent. Hence it is, that in proportion to the nastiness of such places, to the number of dysenteries, of foul sores, and especially of mortifications, the malignant fever is both frequent and mortal *.

§ 4.

Of diseases arising from errors in diet.

IRREGULARITIES in diet are commonly, but unjustly, supposed to have the greatest share in producing military diseases. Were this the case, the changes in the weather and seasons would not so sensibly affect the health of soldiers; the soberest and most regular corps would not be so sickly; different nations in the same camp, living variously, would not be afflicted with the same distempers: nor would there be such an inequality in the numbers of the sick in different years, were the greatest part of the diseases owing to any other causes, than what have been

* This subject, of diseases arising from putrid air, will be more fully treated in Part iii. ch. vi. § 6.

already

already assigned. All therefore that can be admitted on this article is, that there may be certain rules of diet, by the observation of which, soldiers may be made somewhat less liable to sickness; but there can be none proposed that will make any considerable exemption, if the weather, ground, and other circumstances do not concur to favour them*.

A soldier in time of war, by the smallness of his pay, is secured against excess of eating, the most common error in diet. The danger is on the other hand; for when all are not obliged to eat in messes, some will be apt to spend their money upon strong liquors, and to squander away in one day what is but bare maintenance for a week. But when every man is obliged to contribute his share to a mess, we may be assured there can be no errors in diet of consequence, whilst almost the whole pay is bestowed upon common food. For as to the abuse of spirits, and fruit, and drinking bad water, however generally they have been accused, I shall venture to affirm, that these three causes combined never occasioned the tenth part of the sickness in the army.

First as to spirits, it is to be observed, that even when drunk to excess, they tend more to weaken the constitu-

* This article, upon diet, is only to be understood as relating to men in health, and not to the sick, who are always supposed to be under the strictest regulations of diet, depending on the hospital, and never left to themselves or their nurses.

tion than to produce any of the common camp-diseases; or if some actually fell ill after hard drinking, it is certain a far greater number are preserved by taking these liquors in moderation. Let us not confound the necessary use of spirits in a camp, with the vice of indulging them at home; but consider, that soldiers are often to struggle with the extremes of heat and cold, with moist and bad air, long marches, wet clothes, and scanty provisions. Now, to enable them to undergo such hardships, it is proper that they should drink something stronger than water, or even than small-beer, which is always new and bad in camps, and even there too dear for their common use.

And as to fruit, another supposed cause of the camp-fever and dysentery, it must be still more innocent; since these diseases being either of an inflammatory, or a putrid nature, cannot be owing to what is acid. Were the dysentery the effect of eating too much fruit, should we not find it more common among children? Nor indeed are the soldiers over-fond of it; or if they were, have they means to purchase it. We can scarce imagine when the daily pay, after stoppages, can but just procure a pound of good meat, that a man will bestow any part of it upon fruit. A few disorderly men may rob orchards, but the dysentery and camp-fevers are diseases to which the most regular are equally subject. It may be further remarked,

remarked, that our worst flux began in the end of June *, when there was no other fruit to be had but strawberries, which the foldiers never tasted; and that the same distemper intirely ceased about the first of October, when the grapes were ripe, and so plentiful in open vineyards that the men ate what quantity they pleased. To these arguments, add the authority of *Sydenham*, who never mentions fruit as the cause of the dysenteries which were epidemic in *London* in his time †; and *Degner*, another diligent observer, and the author of a treatise on this disease, expressly says, that fruit had no share in producing the dysentery which raged some years ago at *Nimeguen* ‡.

This point being then so plain, it may seem strange how a contrary opinion should have so generally gained belief, if it be not thus accounted for. The bloody flux usually coincides with that season in which fruit is in the greatest plenty; and as fruit is laxative and apt to gripe, it was natural to assign no other cause for the dysentery than eating it immoderately; and the rather as the true cause was so little obvious. But besides that strong people are little subject to a looseness from such a cause, we may observe how different the camp-dysentery is from a *diarrhœa*, in symptoms, danger, and cure. It may be allowed, that eating too much fruit disposes the body to agues, especially in a moist country; but the remitting fever of

* Part i. ch. iii.

† Op. § 4. cap. iii.

‡ Hist. Dysent. cap. ii. § 30.

the camp is somewhat of a different nature, as being mostly attended with a sensible inflammation. But granting, that fruit is capable of producing both fevers and fluxes, such as prevail in an army, yet in some hundreds which have been under my care for these distempers, as I never, upon the strictest inquiry, discovered this to be the cause, I must conclude that it rarely takes place, and may be well omitted in the account. At the same time it will be proper to observe, that whoever is actually under the cure of a flux, or but lately recovered, should be cautious with regard to fruit; for, though the acid may be good for correcting the disposition to putrefaction, yet the bowels may be too much relaxed, and in too tender a state to bear any sharp, cold, or flatulent aliment. For the same reason, those who have lately recovered of intermittents, must either forbear eating it, or use it moderately. Nor should the most healthy person eat freely of it in close and marshy countries; because whatever is of so very cooling and relaxing a nature, may too much weaken the habit, and thereby check perspiration; by which means fruit, though really acid, may lay the foundation of some putrid disease.

Lastly, that many diseases are owing to bad water, has been an ancient and prevailing opinion; and even *Hippocrates* refers various disorders to that cause. But, without entering into an inquiry about the justness of such notions,

notions, I shall only remark, that we are not to apply what is said of the water in the country where that author practised, to what our army commonly drank, which was plentiful and good. The only exception worth notice was in *Zealand*, where the water being indeed less pure, it might concur with other causes in making the sickness more general in that country *. But in all other places our water was blameless, and particularly in the two seasons during which the bloody-flux was most epidemic †.

To conclude, whoever will peruse the account of the several campaigns, will see such an uniformity in the rise and periods of the diseases, and that so much connected with the state of the air, as will be sufficient to convince him, that neither the abuse of spirits, nor of fruit, nor drinking bad water, could have any considerable share in producing them.

§ 5.

Of diseases arising from excess of rest, and motion; of sleeping, and watching; and from want of cleanliness.

THE life of a foot-soldier is divided between the two extremes of labour and inactivity. Sometimes he is

* Part I. chap. i. and vii.

† Viz. In the camp at *Hanau*, in the year 1743; and at *Maastricht* 1747. See part i. chap. iii. and vii.

ready to sink under fatigue, when having his arms, accoutrements and knapsack to carry, he is obliged to make long marches, especially in hot or rainy weather: though the most frequent errors of men of that rank are on the side of rest. But the cavalry lead a more uniform life, having little fatigue by marches, and a constant but easy exercise, both in the field and in quarters, in the care of their horses; one reason for their better health.

Sometimes the service requires such frequent returns of duty, that the men have not time to sleep; but such occurrences are rare, and generally when soldiers are off duty they sleep too much, which enervates the body, and renders it more subject to diseases.

It is well known how necessary it is to keep up the perspiration; and also, how much the uncleanness of the person will concur with other things to frustrate that intention. I have observed in the hospitals, that when men were brought in from the camp with fevers, nothing so much promoted a *diaphoresis*, as washing their feet and hands, and sometimes their whole body, with warm water and vinegar, and giving them clean linen. So that officers judge rightly with respect to the health of the men, as well as to their appearance, when they strictly require cleanness in their persons and clothes.

Under this head, it will be proper to mention the itch, the most general distemper among soldiers. This spreads
so

so easily by the contact of the foul person, or of his clothes, that one in the same tent, mess, or barrack, will often communicate it to the rest: this circumstance, joined to the little attention which men of that rank have to cleanliness, makes it difficult to keep it under, though the cure of each individual be generally easy.

C H A P. III.

Of the general means of preventing diseases in an army.

ALTHOUGH most of the forementioned causes depend on the changes of the air, and other circumstances which can scarce be avoided, yet as all these only dispose the body to sickness, and do not necessarily bring it on, it follows, that such provision may be made, as shall prepare the soldier to withstand most of the hardships incident to a military life. But as this maxim cannot hold strictly with a multitude, it can only be admitted so far, as a large body of men, losing but a few by sickness, may be said to be healthy. I need scarce add, that the preservatives from diseases are not to depend on medicines, nor on any thing which a soldier shall have in his power to neglect; but upon such orders only, as, at the same time that they do not appear unreasonable to him, he shall be made to obey.

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We shall therefore inquire into the means of preservation from sickness, in the order of its causes before-mentioned *; whereof the chief depending on the air, we shall consider the proper precautions to be used in regard to that; and shall next propose some regulations about the diet, and other points that may fall under the direction of the officers.

§ 1.

How to prevent diseases arising from heat, and cold.

TO palliate the effects of intemperate heat, commanders have found it expedient so to direct the marches, that the men should come to their ground before the heat of the day; and to give orders that none of them sleep out of their tents, which in fixed encampments may be covered with boughs, to shade them from the sun †. It is a rule of some importance, to have the soldiers early out, and exercised before the cool of the morning is passed; for by that means not only the sultry heats are avoided, but the blood being cooled, and the fibres braced, the body will be better prepared to bear the heat of the day. Lastly, in hot weather, it will be found proper to shorten the sentinel-duty, whenever the men are to stand without any shade.

* Ch. ii.

† Ne aridis, et sine opacitate arborum, campis aut collibus, ne sine tentoris æstate, milites commorentur. VEGET. *De Re Milit. lib. iii. cap. ii.*

The preservatives from cold consist of clothes, bedding, and fuel. The experience which we have had of the use of under-waistcoats, during the winter-campaign in *Great-Britain* *, should teach us to make the same provision for the whole army, in any future war. None of the foreign soldiers are without this necessary part of clothing; and indeed no man of the meanest condition abroad. Under-waistcoats would not only be useful in winter-quarters, but greatly so, on first taking the field, and towards the end of the campaign. How much likewise watch-coats were wanted for sentinel-duty, appeared from the general account of the diseases during the first winter. A third article, is to provide strong shoes for the soldiers; for it is well known how easily men catch cold by wet feet.

The second means of preservation mentioned was bedding, by which is understood a blanket for every tent of the infantry. This provision, regarded by other nations, has generally been neglected both by the *French* and our army. We have observed of what advantage the cloaks were to the cavalry; how useful therefore blankets must be in preserving the health of the foot, in the beginning and end of a campaign, is obvious. The only point to be considered is, whether the expence, and impediment of so much baggage, will over-balance that advantage †.

* Part I. chap. vi.

† Since the first editions of this work, all the foot upon service have been provided with blankets.

The last article was fuel. Of this our soldiers might require a greater supply, as being of all military people the least inured to cold: but, as bearing some degree of it in winter-quarters may tend to harden them against an early campaign, all that is requisite, is to give them enough for dressing their victuals, correcting the dampness of their barracks, and the rigour of a severe winter; and to trust rather to their warmer clothes and exercise, than to fire, for preventing diseases arising from cold. We find these two articles of clothes and fuel particularly recommended to the care of commanding officers by *Vigetius*, an author who has preserved the maxims of the old *Roman* discipline *.

§ 2.

How to prevent diseases arising from moisture.

WHEN troops are to go into garrison, it is the business of the quarter-masters to examine every barrack offered by the magistrates of the place, and to reject all ground-floors in houses, which either have been uninhabited, or have any signs of moisture. We had an instance of the comparative dryness of upper stories †, which are

* Non lignorum patiantur (milites) inopiam, aut minor illis vestium suppetat copia; nec sanitati enim nec expeditioni idoneus miles est, qui algere compellitur. *De Re Milit. lib. iii. cap. ii.*

† Vid. part I. chap. ii.

always

always preferable, and particularly in the *Netherlands*, where the houses are without drains. But if dry habitations cannot be procured, the only resource against sickness from moisture will be an increase of fuel.

In the field, the best security is by making trenches around the tents ; by which means not only the natural moisture of the ground is lessened, but the rain-water is intercepted and carried off without wetting the straw. This is always necessary when a camp is to remain above a night or two on the same ground.

It is of great importance to allow the soldiers plenty of straw, and to have it often renewed ; for a dry and fresh bedding is not only comfortable, but a preservative against diseases, and one reason of the better health which soldiers generally enjoy upon shifting ground, as the damp or rotten straw is then left behind. But in fixed camps, when the straw is not often enough changed, it will be proper to have the tents opened every day for some hours ; and once in a few days to have all the straw taken out and well aired : without this precaution it will not only grow damp, but soon rot and prove unwholesome.

It will also be necessary for the officers to air their tents daily ; without which every thing will contract moisture. They are farther to be advised not to lay their matras upon the grass, but to raise their bedding from the ground,

or to use a bedstead. Oil-clothes spread on the ground of the tent, and kept dry, intercept much of the rising vapour. Towards the end of the season, when the weather grows cold and damp, it will be found useful to burn spirits in the evening, in order to warm and correct the air in the tent. But at no time are the officers to confine the air too much, not even in cold weather, and especially when sick; taking it for a rule, that there is more danger in breathing in a moist atmosphere, loaded with their own *effluvia*, than in an open tent with a close marquise.

Soldiers are unavoidably exposed to rain on marches and out-duty, and upon having wet-clothes are liable to sickness, unless they be allowed to cut down wood to burn in the rear of the camp; an indulgence which I have observed to be necessary on these occasions.

Where the grounds are equally dry, the camps are always most healthful on the banks of large rivers; because in the hot season, situations of this kind have a stream of fresh air from the water, tending to carry off both the moist and putrid exhalations. And in cantonments, we are not only to seek villages removed from marshy grounds, but such as are least choaked with plantations, and stand highest above the subterraneous water. In moist countries, towns are generally preferable to villages, or single dwellings, for the reasons already given *.

* Part I. chap. i. and chap. viii.

§ 3.

How to prevent diseases arising from putrid air.

HAVING in the last chapter mentioned the common sources of putrid air affecting an army, I shall now offer a few considerations upon the means of removing, or lessening each in particular.

First, with regard to the putrid air of marshes and other stagnating water, the preservatives mentioned under the article of moist air are in a great measure applicable here. If the military operations shall oblige an army to continue long upon such ground, the best expedient will be to make frequent removes*; for, by shifting, the straw will be changed, the men will have more exercise, and the privies will be left behind, which in camps are more than ordinarily noxious on account of the frequency of the dysentery.

As for cantonments in marshy grounds, if the troops must remain there in the dangerous season, it will be better to float the fields intirely, than to leave them half dry: for the shallower the water is, the more it will

* Si autumnali æstivoque tempore diutius in iisdem locis militum multitudo consistat, ex contagione aquarum et odoris ipsius foeditate, vitiatis haustibus, et aëre corrupto, perniciosissimus nascitur morbus, qui prohiberi aliter non potest nisi frequenti mutatione castrorum. VEGET. *De Re Milit. lib. iii. cap. ii.*

corrupt, and the evaporation will also be greater in proportion. The regiment at *Helvoirt*, which lay off the inundation about half a league only, was an instance how near troops may lie to marshes without any remarkable sickness * ; at least if the wind should carry the vapours a different way. Commodore *Mitchel's* squadron in *Zealand*, and the healthy cantonments at *Eyndhoven*, *Lind* and *Zelft*, in a sickly neighbourhood, afforded more instances of the same nature †. Nay, it has been observed at *Rome*, that the sphere of malignant vapours from the adjoining marshes has extended to those parts only which lay nearest them, occasioning bad fevers there, whilst the rest of the city was healthful ‡. Thus, sometimes a little remove from the marshes may prevent a general sickness ; but if that be inconsistent with the service, as happened in the campaign of 1747, when some battalions were sent to *Zealand*, and in the summer following, when our troops were cantoned among the inundations, we must be content to palliate what we cannot avoid. But as this is chiefly to be done by diet and exercise, we shall postpone the rules, till we come to treat of those articles.

Whenever the dysentery begins to spread, the best means of preserving health are to leave the ground, with the privies, foul straw, and other filth of the camp ; which

* Part I. chap. viii.

† Part I. chap. vii. and chap. viii.

‡ LANCIS. De Nox. Palud. Effluv. lib. ii. epid. i. cap. iii.

method is to be repeated once or twice more, or oftner, if consistent with the military operations ; or at least till the middle of *September*, when the danger is in a great measure at an end. The first campaign furnished a good argument for this practice ; for the long continuance on the same ground, at *Hanau*, kept up the rage of the dysentery, which, upon decamping, suddenly abated *. And in the year 1745, the flux was milder than ever was known, which we imputed not only to the coolness of the season, but also to the frequent removes during the time that the army was most liable to the distemper †. But if any circumstance should make it improper to change the ground, when the dysentery begins to spread, other methods must be taken to check its progress.

In order therefore to preserve a purity of air in the the dysenteric season, let there be some slight penalty, but strictly inflicted, upon every man that shall ease himself any where about the camp, but on the privies. Further, from the middle of July, or upon the appearance of a spreading flux, let the privies be made deeper than usual, and once a day a thick layer of earth thrown into them, till the pits are near full, which are then to be well covered, and supplied by others. It may also be proper to order the pits to be made either in the front or rear, as the then stationary winds may best carry off their *effluvia* from

* Part i. chap. iii.

† Part i. chap. v.

the camp. Moreover, it will be necessary frequently to change the straw, as not only apt to rot, but to retain the infectious steams of those who have fallen ill of the distemper. But if fresh straw cannot be procured, more care must be taken in airing the tents and the old straw, as before directed.

Lastly, when the disease begins to be frequent, the sick should not be sent to one common hospital; at least not in such numbers as to vitiate the air, so as not only to communicate the infection to others, but to keep it up among themselves. This rule will be much enforced by attending to the facts mentioned in the account of the campaign in *Germany**, compared with what passed in the summer 1747†. Therefore when the dysentery prevails, the regimental surgeons are to treat the sicker cases in the camp itself, and as many of the rest as they can conveniently attend or accommodate in the regimental hospitals, which are then particularly to be chosen spacious and airy. Barns, granaries and the like places, will allow the steams to disperse, without any danger from cold, since the weather is usually warm during that season. As to the general hospital, let it receive such only as the regimental hospitals cannot well contain, and the sick that cannot be moved with the army. Without this dispersion of the sick, the general hospital may, in

* Part I. chap. iii.

† Ibid. chap. vii.

bad seasons, be charged with some thousands, who cannot be well attended, but by a greater number of physicians than has been allowed by the public. But, were that objection removed, it would be still unadvisable to have but one common hospital, on account of the mortality that usually ensues upon crowding together such a number of men, ill of so putrid a disease.

Having, in the account of almost every campaign, mentioned the fatal effects of the hospital-fever, I need not urge the necessity of using precautions against it. Without entering upon a particular description of its nature, which is reserved for the third part of this work, I shall at present only propose the means whereby this disease may be kept either from appearing at all, or, at least, with so much contagion and danger. These means shall be considered under two heads; one, relating to the choice of hospitals; and the other, to the right management of the air therein.

In treating of the bloody-flux, the most airy and spacious houses, to be procured in the neighbourhood of the camp, were recommended, for the better recovery of the sick, and for guarding against infection. Now the same means will also tend to prevent the hospital-fever, as the dysentery is so apt to breed it*. On these occasions, it is

* The putrid *effluvia* of the dysenteric *fæces* are not only apt to propagate the dysentery, but likewise to breed the jail or hospital-fever, with, or without bloody stools.

common to look out for close and warm houses, and therefore to prefer a peasant's house to his barn; but experience has convinced us, that air, more than warmth, is requisite. For this reason, not only barns, stables, granaries and other out-houses, but, above all, churches make the best hospitals, from the beginning of June till October. Of this there was an instance in the campaign of 1747, when a large church at *Maestricht* was applied to that use; and where, notwithstanding above an hundred lay in it, with foul fores, fluxes, and other putrid diseases, for three months together (during the greatest part of which time the weather was very hot) there was no appearance of this fever*. Therefore we may lay it down as a rule, that the more fresh air we let into hospitals, the less danger there is of breeding this distemper.

Another point to be observed in a fixed camp, is to have the regimental hospitals scattered, and not crowded into one village. And for the same reason, if it should be necessary for the general hospital to admit a great number at a time (which must frequently be the case, upon the motion of an army after a long encampment) it will be proper to have the sick dispersed into two or three villages, rather than kept in one; though a narrower compass may be more for the œconomy of the hospital, and the easier attendance on the sick. The want of pure and

* Part I. chap. vii.

wholesome air can never be compensated by diet or medicine: so that there appears the greater necessity of carrying, at all times, as many of the sick along with their regiments as can easily be transported in waggons.

It may be necessary to add the following distinction. In the first part of a campaign, when inflammatory distempers prevail, those who are taken ill are to be left behind, as such cases least admit of motion, and at the same time are not infectious. But those who fall ill from the end of summer to the decline of autumn, as having diseases of a putrid kind, but which bear motion and generally mend upon a change of air, are rather to be carried with their regiments and dispersed, than collected into one general hospital to propagate the infection.

As these regimental hospitals are of such consequence, it would be proper to supply them with blankets and medicines from the public stores, with an allowance also for nurses and other necessaries. Nor is this care requisite in the field only, but also in winter quarters; as there will generally be more sick, on breaking up camp, than can be well attended by the physicians upon the establishment. In the campaign 1743, about 3000 were left in the general hospitals; and in the year 1747, upon going into winter-quarters, the *returns* of the sick amounted to 4000. In the course of the war, one physician has sometimes had the charge of 700 at a time; in which case, though

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the hospital might be said to have a physician, it could reap little advantage from his attendance. But suppose, that a sufficient number of physicians were employed, and that every other circumstance were in proportion, yet the crouds, by corrupting the air, would render most of the care ineffectual. This may easily be conceived from what has really happened; for passing over the pestilential mortality in the hospitals of the first campaign, and taking the rest since at a medium, there has been commonly such a degree of bad air in them, as to render the practice but little successful; insomuch, that upon the most favourable computation, I have not found that fewer than one in ten died of all that were admitted. Besides the better chance for good air, there is a farther advantage accruing from regimental hospitals, which is, that the several surgeons are best acquainted with the constitution and disposition of their patients, as well as with all the circumstances of their distempers. And as the physician is still to be resorted to in any case of difficulty, or is to make regular visits, there can be no objection made to this method of treating the sick, which, as often as it has been tried, I have observed to have been more successful than that of one large and general hospital. To enable the surgeons the better to attend those of their own regiments, it would be proper in time of war to give each an additional mate, as it must often happen that the sick will be too numerous to be well taken

care of by himself and one mate only: besides, in sickly times, one of them may fall ill, or possibly both at once.

We shall next consider the general hospitals which are of two kinds, *viz.* the flying hospital attending the camp at some convenient distance, and the stationary hospital which is fixed to a place. In the choice of both, those who have the direction should take care that the wards be as large and airy as possible, remembering that warmth is not wanting in summer, and that in winter it is chiefly to be procured by fires. It would also be better to have the general hospitals in towns than in villages, as the former will furnish larger wards, besides other conveniences.

As to the disposition of hospitals, with regard to preserving the purity of the air, the best rule is, to admit so few patients into each ward, that a person unacquainted with the danger of bad air, might imagine there was room to take in double or triple the number. It will also be found a good expedient, when the ceilings are low, to remove some part of them, and to open the garret story to the tiles. It is surprizing in how few days the air will be corrupted in close and crowded wards, and what makes it hard to remedy the evil, is the difficulty of convincing either the nurses or the sick themselves, of the necessity of opening the doors or windows at any time for air. I have generally found those wards the most healthful, when, by

broken windows and other wants of repair, the air could not be excluded.

It is therefore probable, that when fire-places are wanting, a preservative would be found in the use of the late reverend Dr. *Hale's* ventilators, whereof some might be made for the hospitals small enough to be easily carried about. By such an invention we might hope for a considerable purification of the air in every ward; and the working them might be a good exercise for the convalescents. As these ventilators must be of a smaller size, for the convenience of carriage, the same might be likewise used on board the transport ships *.

In winter-hospitals, chimneys only should be used, and stoves never; for, though the latter may warm a large ward

* I was favoured with the following paper of directions from the celebrated inventor, whom I consulted on this occasion, but his method was never put in practice.

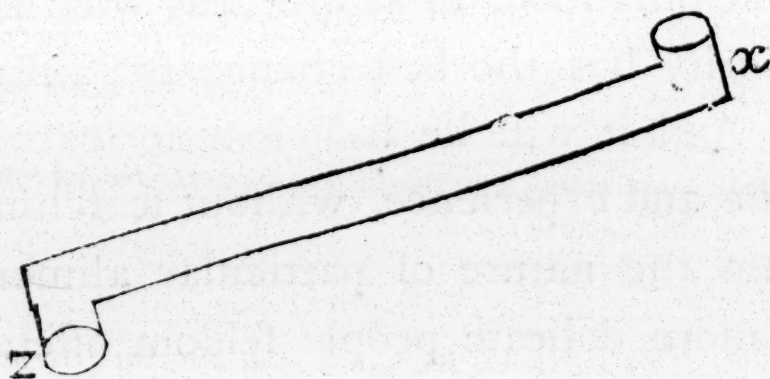
Some considerations about means to draw the foul air out of the sick rooms of occasional army-hospitals, in private houses in towns.

As it seems improper to draw the air out of these rooms, by small moveable ventilators placed in the passages between the rooms, because the foul air that is drawn out will soon return from those passages into the sick rooms; so the most likely means that occur to me for doing it, is to have a board screwed fast, and not nailed, because of the noise, to the upper part of a window on the outside of each room. This board is to have a round hole in it, and also the glass opposite to it, of a size to receive a trunk of a sufficient length to reach from the window to a small ventilator on the ground through which the foul air is to be drawn out of each room, the fresh air entering in at the door: this is to be repeated as often in a day as shall be thought proper.

ward better and at less expence, yet by making scarce any draught of air they will be apt to promote its putrefaction, whereas a fire kept up in a chimney acts like a constant ventilator.

If ventilators are used, other precautions will be the less necessary; but if they are not, we must have recourse to such other means as may help to purify the air. Among these, the most common is burning frankincense, the wood or berries of juniper, or some other resinous or antiseptic vegetable. The steams of vinegar are often recommended on these occasions, and probably would best

It will be requisite to have the holes both in the board fixed over the window, and in the side of the ventilator made round to receive the corresponding round orifices of the trunks; by which means the same trunk may serve for windows of different heights, by being placed more or less obliquely, thus: viz. x, the end at the window; z, the end fixed to the ventilator.



There may be trunks of different lengths, and made to join into each other, for the higher windows. As these trunks are to be made of thin fir-boards, about five inches broad, they need not be nailed together in the form of a trunk till they are to be used, and may therefore lie in a small compass.

A very small ventilator will be sufficient for this purpose: viz. about five feet long, and twenty inches wide and deep, such as is described in my ventilator book, fig. 6.

answer

answer the purpose ; but being not so commodiously diffused as other things that burn, they have hitherto been less used. The burning of sulphur, or gun-powder, is also mentioned by authors as proper in such cases ; and from the acidity of their steams they seem likely to succeed.

§ 4.

How to prevent diseases arising from improper diet.

IT is to be observed, that no orders will be able to restrain soldiers from eating and drinking what they like, if they have money to purchase it. Therefore a fundamental rule, and indeed almost the only one needful, is to oblige the men to eat in messes ; by which means, we may be assured that the best part of their pay will be bestowed on wholesome food, in as much as what is agreeable to the majority has the best chance for answering that character. And it will be sufficient to leave the choice to their taste and experience, without searching too scrupulously into the nature of particular aliments, which even with more delicate people seldom offend so much in kind as in quantity. The greatest impediments to messing, are the wives and children, who must often be maintained on the pay of the men : in such circumstances, it is not improper food, but the want of it, that may endanger a soldier's health. This method being established,

it

it only remains to take care that the men be supplied with good bread; and that the markets be so regulated that the traders have encouragement to come to the camp, and the messes have good provisions at a moderate price, vegetables in particular, which during the hot weather ought to make a great part of the diet. Though the pay of a *British* foldier is better than that of other troops abroad, yet his oeconomy is less; so that after giving in his proportion to the messs, there is little danger of his having wherewithal to make a debauch. How far some quantity of strong liquors is useful, has been already shewn*.

As the heats of summer tend to produce diseases in autumn, by disposing the humours to corruption, it were to be wished that during the hot season the diet was so ordered that this tendency might in some measure be corrected. It may deserve our notice, that the *Romans* considered vinegar as one of the most necessary provisions of an army †. Now, whether this was only used by way of seasoning to their victuals, or mixed with water and drunk whilst they were hot or feverish, it must have had a good effect in correcting the too great putrefecency of the blood during the summer. Vinegar-whey,

* Part ii. chap. ii. § 4.

† Hyeme lignorum et pabuli, æstate aquarum vitanda est difficultas. Frumenti vero, vini, *aceti*, nec non etiam salis omni tempore vitanda necessitas. VEGET. De Re Milit. lib. iii. cap. iii.

already

already known in the hospital, is a cooling medicine in inflammatory fevers, and was liked by the patients. But the surest way of making soldiers take vinegar or any other acid, by way of preservative, is by mixing it with such a proportion of spirits as may be thought a proper quantity for each man; and especially when troops are sent into *Zealand*, or the more marshy parts of *Brabant* or *Flanders*, during the sickly season in those countries.

Pork has sometimes been forbid in camps, being looked upon as unwholesome. *Sanctorius* observes that it checks perspiration; and as it corrupts sooner than beef or mutton, it may be presumed to afford a less proper nourishment than either, when there is danger from putrefaction. It is also believed, that in camps, the meat in general is too little bled, and thereby becoming sooner tainted, concurs with other causes in breeding putrid diseases.

In establishing the messes, some regulations might be made with regard to an allowance of spirits, whether by stoppages on the pay, or otherwise. This is already practised in the navy, and probably for the same reason for which it might sometimes be proper here; since, in ships, men are also liable to distempers arising from moist and corrupted air.

The officers, whether in camp, or in cantonments in a moist country, are exposed, though in a less degree than
the

the common men, to the same diseases of the season and climate. Their chief rule in diet, in sickly times, is to eat moderately, avoiding surfeits and indigestion *. Wine is necessary; but excess in every thing is at this time dangerous. I shall conclude with that prudent rule of *Celsus* for preserving men against distempers arising from a moist and corrupted state of the air: *Tum vitare oportet fatigationem, cruditatem, frigus, calorem, libidinem* †.

§ 5.

How to prevent diseases arising from errors in exercise.

THE greatest fatigue which a soldier undergoes is in making long marches, especially in hot or rainy weather. When the service requires it, such hardships must be endured; but they will be attended with less sickness, if care be taken to supply good provisions and plenty of dry straw. At other times, when dispatch is not required, short marches before the heat of the day, with proper halts, are so far from harassing the troops, that nothing can be more conducive to preserve their health. In fixed camps, as there is always more sickness from inactivity than from fatigue, it would be necessary to make proper regulations about the exercise at such times; and the

* Si qua intemperantia subest, tutior est in potione quàm in escâ. CELSUS De Med. lib. i. cap. ii.

† Lib. i. cap. x.

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rather,

rather, as our soldiers left to themselves are naturally too indolent to use what is proper for them.

The exercise of a soldier may be considered under three heads ; the first relates to his duty ; the second, to his living more commodiously ; and the third, to his diversions.

The first, consisting chiefly in the exercise of his arms, will be no less the means of preserving his health than of making him expert in his duty* ; and frequent returns of this, early and before the sun grows hot, will be more advantageous than repeating it seldom, and staying too long out at a time : for, a camp affording little convenience for refreshment, all unnecessary fatigue is to be avoided.

As to the second article, cutting boughs for shading their tents, making trenches around them for carrying off the water, airing the straw, cleaning their clothes and accoutrements, and assisting in the business of the messes, are all things which, as they must be strictly executed by orders, ought to be no disagreeable exercise to the men for some part of the day.

* *Rei militaris periti, plus quotidiana armorum exercitia ad sanitatem militum putaverunt prodesse, quam medicos. — ex quo intelligitur quanto studiosius armorum artem docendus sit semper exercitus, cum ei laboris consuetudo et in castris sanitatem, et in conflictu possit præstare victoriam. VEGE. De Re Milit. lib. iii. cap. ii.*

Lastly, as to diversions, since nothing of that sort can be enforced by orders, the men must be encouraged to them, either by the example of their officers, or by small premiums to those who shall excel in any kind of sports, which shall be judged most proper for answering this purpose. But herein some caution is necessary with regard to excess, because our common people generally observe no medium between their love of ease and pursuing the most violent exercise. And however necessary motion may be to troops in fixed camps, we are to beware, on the other hand, of giving them too much fatigue, especially in hot weather, and in times of sickness; and above all, of exposing them to wet clothes, which, as has been fully set forth, is one of the most frequent causes of camp-diseases.

C H A P. IV.

The seasons compared, with regard to the health of an army.

IN the beginning of every campaign we are to expect, for the first month at least, that the *returns* will be considerably higher than if the men had remained in quarters. The earliest encampment began on the 8th of April *, and produced such a number of sick, that in a month's time the *returns* amounted to $\frac{1}{27}$ th part of the whole. In the year 1745, the campaign was opened on the 25th of April; and in 1747, on the 23d of the same month; both

* Part i. chap. viii.

in the *Low-Countries* : but in the year 1746, the troops encamped on the 23d of April, in the north of *Scotland*; which, considering the latitude, may be reckoned of all the earliest campaign during the war. And from all these instances there is reason to believe, that the first proportion mentioned will generally hold, when the army takes the field, in *Flanders*, in the first or second week of April.

But if the troops were to continue in quarters till the middle of May, the sickness of the first month would be considerably less, though perhaps not so much as might be expected. Thus, in the first campaign, the *British* encamping on the 17th of May *, had in the hospital, after the first month, about $\frac{1}{32}$ part of the whole number; a proportion, however, which we cannot offer as a general one, because the men had then made a long march, and it was their first campaign. The next year, when the troops marched out on the 13th of May, after a month's encampment, there was found in the hospitals about $\frac{1}{40}$ th part only; but as the weather was then mild, and other circumstances favourable, the proportion may perhaps be reduced in common years to $\frac{1}{36}$ th: so that, *ceteris paribus*, the number of the sick will be after the first month about $\frac{1}{4}$ th greater when the army encamps in the middle of April, than when it takes the field a month later.

After the first fortnight or three weeks of the encampment, the sickness daily decreases, as the most infirm are

* Part i. chap. iii.

already

already in the hospital, the rest more hardened, and as the weather is growing daily warmer. This healthy state continues throughout the summer*, unless by some extraordinary exposition to rain, the men get wet clothes, or lie wet; in which case, in proportion to the preceding heats, the dysentery will be more or less frequent.

The great sickness commonly begins about the middle or end of August, whilst the days are still hot, but the nights cool and damp, with fogs and dews; then, if not sooner, the dysentery prevails, and though its violence is ended by the beginning of October, yet the remitting fever gaining ground continues throughout the rest of the campaign, and never entirely ceases, even in quarters, till the frosts begin.

The sickness in the beginning of the campaign is so uniform, that the number may be nearly predicted; but for the rest of the season, as the diseases are then of a contagious nature, and depend so much upon the heats of the summer, we cannot well foresee how many may fall sick from the beginning to the end of autumn. At the end of the campaign in *Germany*, the number in the hospitals was to the men in health as 3 to 13. In 1747, when the troops left the field, the sick made about $\frac{1}{3}$ th part of the whole number: but if we consider by itself the detachment sent that year into *Zealand*, this proportion was

* That is, until the middle of August.

just inverted; for the men in health were to the diseased, only as 1 to 4. Upon closing the campaign in 1744, though half of the army were new men, we had but 1 in 17 sick; and in the year following, which was remarkable for health, there was not above 1 in 26 ill: but in both these years the troops returned into winter-quarters sooner than usual.

I have observed, that the last fortnight of a campaign, if continued till the beginning of November, is attended with more sickness than the first two months of the encampment. If campaigns are therefore to last six months, it imports much as to health, whether they begin early, or late. For though it may be thought safer for troops to delay encamping till the beginning of May, and to stay out till the end of October, yet experience shews it is better to go out a fortnight sooner, in order to return so much the earlier into winter-quarters.

We have already observed, that the remitting fever does not always terminate with the campaign, but continues in quarters till the frosts begin; and that there are no other acute distempers, excepting such as are occasioned by great colds *, from that period till the next encampment. But of chronic diseases, since the autumn has laid so large a foundation for them, a variety will always

* Part ii. chap. i. and ii.

occur, and those generally arising from obstructed *viscera*. Yet upon the whole, the *returns* of the sick will so much decrease, that if the troops are but tolerably accommodated, and the foregoing autumn has not been unusually bad, they will probably next spring take the field without leaving above one man in 40 behind.

Winter-expeditions, though severe in appearance, are attended with little sickness, if the men have good shoes, quarters, fuel, and provisions. Of this, we had one proof in the march into *Germany*; and another, in that to the North in the year of the rebellion. But long marches in summer are not without danger, unless they are made in the night, or so early in the morning as to be finished before the heat of the day.

Those who fall ill in the camp (especially in the decline of summer) so as to be confined for some time to the hospital, are during that season not to be relied upon for service; for being weakened by their sickness and lying warm while under cure, they will be liable to relapse as soon as they return to the field. It would therefore be proper to employ the convalescents in garrisons for the remainder of the campaign, or at least till they have full time to recover; for which end hospitals have neither accommodation nor air. It would also tend much to prevent diseases, if the sickly, or unseasoned corps, were
sent

sent a fortnight earlier than the rest into winter-quarters, whenever that is consistent with the service.

Having mentioned the seasoning of troops, it may be proper to add the following caution, as a mistake here may be made so easily. By well-seasoned troops are commonly understood, such as having gone through much fatigue are therefore supposed best qualified to bear more. But in this we may be deceived; because such corps as have been rendered sickly by service, will never afterwards be strong, or fit for new labour, till all the infirm are dead or dismissed. For, as soldiers in time of war are not only subject to violent disorders, but have little time or convenience for recovery, if once they fall ill, it is odds but their constitution will be so weakened, as to make them ever after more liable to diseases. I shall mention two instances. In the year before the war our troops having encamped on *Lexden-heath* near *Colchester*, and staid out late, returned sickly into quarters. Now, it was observable, that those who recovered and went over to *Flanders* were the first sick in the garrisons; and that the same men, with others who were taken ill in the *Low-Countries*, were also most sickly in the cantonments, and afterwards in the camps in *Germany*. So that these corps were never healthy till they lost all their weak men; which indeed in a great measure happened during the course of the first campaign. The second instance is of those detach-
ments

ments in *Zealand*, and at *Bergen-op-Zoom*, which suffering greatly by the bad air of the country, the same battalions, in the beginning of the next campaign, were remarkably more sickly than any of the rest *. But as the first campaign in *Flanders* (though succeeding the sickly one in *Germany*) was healthful †, and as the next was still more so ‡, some may thence infer that troops are only liable to suffer in the first year, and being then seasoned will afterwards undergo the usual military fatigues unhurt. But, besides that the weather was very favourable during the second and third campaigns, and that the camp broke up early in both, it must be remembered, that all the corps which had been in *Germany* had lost almost all their sickly men there; so that those who took the field in the next year were either old soldiers, who had never been ill, or recruits, *additional*s, or regiments which had come fresh from *England*: these therefore holding out well, were rather a proof of what is advanced above. And if the third campaign was still more healthful than the second, it is to be observed, that the army happened then to be in its best state; consisting chiefly of fresh soldiers, or of men who never had been ill, or of those who were properly seasoned by having made a short campaign in moderate weather. But as a clear proof that the health and hardiness of troops is not to be measured by

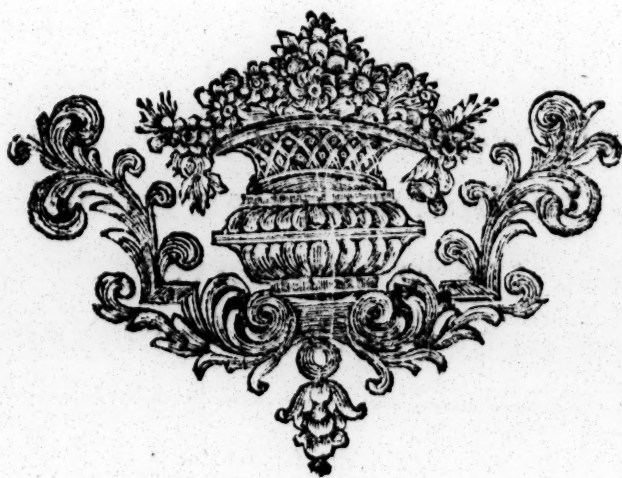
* Part i. chap. vii. and viii.

† Part i. chap. iv.

‡ Chap. v.

the time they have served, in the two last years of the war, the sick were in proportion as numerous as they had been in the two first: and what happened in the cantonments in *Dutch-Brabant*, during the last campaign, shews that no seasoning can avail against the influence of the moist and corrupted air of marshes.

The whole amounts to this. Considering all the hardships, and expositions to colds attending the easiest service, those troops will be best seasoned to undergo the fatigues of a second campaign, whose constitution has been least weakened in the first.





O B S E R V A T I O N S
O N T H E
D I S E A S E S O F T H E A R M Y.

P A R T I I I.

C H A P. I.

Observations on colds, and inflammatory fevers in general.

HAVING laid down the division of the diseases most incident to an army, with the remoter causes and means of prevention, I shall proceed in this part to offer some practical observations upon each distemper, in the order in which they were proposed*; and therefore shall begin with such as depend upon inflammation only.

But as inflammatory disorders are every where common, and are treated by so many authors, I shall not enter in-

* Part ii. chap. i.

to a particular account of any, but make a few remarks on such as most frequently occur in military hospitals.

Upon first taking the field, as well as during the winter, pleurifies and peripneumonies are the most common forms of the inflammatory fever; and next to them, fevers attended with rheumatic pains. The inflammation turns also upon the brain, liver, stomach, and other *viscera*. Universally, the fever taking its rise from a stoppage of perspiration (or from whatever is the primary effect of cold) by first inflaming any of these parts seems afterwards to be kept up by that inflammation.

Sometimes we can perceive no part more affected than another, and only some general inflammatory symptoms. The distemper is then called simply an inflammatory fever, although probably some of the more indolent parts may at this time be affected with inflammation. This fever is most common after the weather begins to be warm. But inflammatory fevers are seldom seen single in the end of summer, or in autumn; for at such times exposures to cold, or moisture, produce fevers and fluxes of a putrid kind, where the inflammation seems to be often the least part of the disease.

For, after the summer solstice, the fevers tend mostly to remit, and are attended with less fizy and more putrescent blood. But towards the end of the campaign, when the weather

weather grows cold, more inflammatory symptoms are joined; so that the fevers may be said, at that time, to depend on two different causes.

Among the mixed inflammatory fevers may be likewise reckoned the vernal intermittents, which upon the first encampment not only seize those who have had agues in the preceding autumn, but others who never had any. These are the more carefully to be distinguished from true intermittents, as they are to be treated chiefly by bleeding and other antiphlogistic remedies. If the Bark be given whilst the blood is inflamed, or before there is a proper intermission, the distemper will either be changed into a continued fever, or stop for a while to recur with worse symptoms.

The inflammatory fevers of an army differ from others, only in being more violent, and perhaps more frequently attended with a *diarrhœa*. The severities of the weather, to which a soldier is so much exposed, his backwardness to complain of the first symptoms, his rough lying when first taken ill, or his being carried to an hospital at a distance in a waggon, when already in a fever, account sufficiently for the first; and it is the stoppage of perspiration by lying cold, or by drinking improper liquors when first seized, that is the cause of the looseness.

As bleeding is the principal remedy in the cure of all inflammatory diseases, the delaying it too long, or not repeating it often enough in the beginning of bad colds, is the chief cause of their ending in dangerous inflammatory fevers, or in rheumatisms or consumptions: and as a foldier applies first to the surgeon of his regiment, on him it chiefly depends to prevent many fatal disorders by the timely use of the lancet. In general, young practitioners are too sparing in letting blood, and delay it too long. But the surgeon may be assured that soldiers will seldom complain of a cough, or pains with inflammatory symptoms, wherein immediate bleeding is not proper; and from the continuance of the complaints, he is to judge of the necessity of repeating the evacuation; which, in the case of a stitch or difficult breathing, is never to be omitted, even in the advanced state of the fever. I have generally ordered from twelve to sixteen ounces, or more, to be let at the first bleeding, and somewhat less at all the rest. Here it may be proper to follow *Celsus's* rule, in observing the colour and consistence of the blood whilst it flows; that is, when it is thickish and of a dark cast (which it always is in difficult breathing and great inflammations) to take it away more freely *. When large quantities are necessary, it is best to bleed the patient lying, in order to prevent his fainting before enough be

* De Med. lib. ii. cap. x.

drawn; otherwise, in all inflammatory pains, the *animi deliquium*, upon the loss of blood, is reckoned a favourable circumstance.

Another prevention (if the patient can have a bed) consists in an early sweat; for which, one of the best medicines is a large draught of warm vinegar-whey with some spirit of hartshorn, at bed-time *. It has been usual to give the *theriaca*, or some other hot medicine for this purpose; but all such drugs increase the fever if they fail of bringing out the sweat, whereas this saline mixture operates without heating. The *theriaca* is rendered more sudorific and less narcotic, by adding to half a drachm some grains of the salt of hartshorn, and by encouraging the sweat with vinegar-whey, or plenty of thin water-gruel acidulated with vinegar. But as to preventing fevers, that will fall more in the way of the regimental surgeons than of the physicians attending the hospital, who rarely see the patient till either the fever be quite formed, or so far advanced as not to be removed by sweating.

If therefore the feverish disorder or cold has been of two or three days standing, it is to be treated by bleeding, and such medicines as are not heating, and yet tend to remove

* Or give at bed-time two scruples of the salt of hartshorn, saturated with about three spoonfuls of common vinegar, in one draught, and promote the *diaphoresis* with some warm diluting liquor.

the inflammatory obstruction and promote perspiration. Some have thought nothing so efficacious for this intention as the *spiritus Mindereri* *; the internal use of which was first mentioned by the celebrated *Boerhaave* †, and afterwards introduced into practice, at *Edinburgh*, by the late *Dr. John Clerk*, a physician of eminence in that city ‡. But during the former war I followed the common method of joining the *testacea* to nitre, without any particular attention at first to the effects of the former; but
as

* *Pharmacop. Edinburg.* But it is to be observed, that as to the names and compositions of medicines, unless where it is expressed otherwise, as here, I follow the last edition of the *London Dispensatory*, viz. that of the year 1746.

† *Chem. vol. ii. proc. cviii.*

‡ As it may give satisfaction to the reader, to have *Doctor Clerk's* observations upon the effects of this medicine in various cases, I shall subjoin his own account, in the following extract of a letter which he favoured me with on this subject.

“ In relation to the *spiritus Mindereri*, I never gave above half an ounce for a
“ dose. When I intend to promote a *diuresis*, I give that quantity twice a day,
“ mixed with an equal portion of *syrupus de althæa*, and find it seldom fail. But in
“ a dropsy, I more commonly make use of the *julapium diureticum Pharmacopæiæ*
“ *Pauperum Edinburgensis*. I have sometimes added the *sal succini*, when I was
“ sure of its being genuine; but that is rarely to be found. For that reason it is
“ left out of the *Pharmacopæiæ Pauperum*, and the spirit put in its place; which
“ has the same *ratio* to the salt, that the spirit of hartshorn has to its salt; though
“ formerly not being in use, it was thrown away as of no value. When I give
“ the *spiritus Mindereri* to promote a *diaphoresis*, I always add a small quantity of
“ *sal cornu cervi* to give it the alkaline cast, as in the *haustus diaphoreticus Phar-*
“ *macopœiæ Pauperum*. When I design to bring on a plentiful sweating, as in rheu-
“ matic diseases, I use the *julapium diaphoreticum (Pharmacop. Pauper.)* two spoon-
“ fuls

as I have since discovered a septic quality in those substances by experiments out of the body, it seems natural to conclude that they exert a like power when taken by way of medicine*. And this perhaps would be more frequently seen, were it not for the quantity of acids usually given in acute diseases; in which case not only the septic nature of the *testacea* may be destroyed, but the acid neutralized, and thereby rendered more diaphoretic. The putrefying quality of these powders is also corrected by the *contrayerva*-root, and by the camphire which was added to them. The common dose was ten grains of the *pulvis contrayervæ compositus*, with as much nitre, and three grains of camphire reduced to a powder, and given four times a day.

These powders were given partly to promote a *diaphoresis*, when nature seemed to be pointing that way, and partly to abate spasms, as the head was so apt to be affected: upon the whole it was a medicine which had little

“fuls every hour, or hour and a half, till the sweat breaks out; repeating it *pro re nata*, when warm diluting liquors are not sufficient to keep it up. I have given “of the spirit in this manner about two ounces, and ten grains of the *sal cornu cervi* in the space of four and twenty hours. In topical inflammations, I give it “the acid cast by mixing with it an equal quantity of *acetum scilliticum*. I “have often given it so in pleurifies and peripneumonies. I understand that some “of my brethren use this form only. Of all neutrals, I take the *sal Ammoniacum crudum* to come nearest the *spiritus Mindereri*. I use sometimes the *bolus diaphoreticus Pharmacopœiæ Pauperum*, but I do not find it nearly so efficacious as the “julep.”

* Append. paper iii. exp. xxiii.

sensible effect, and therefore I laid the less stress upon it. We may observe, that in fevers in different countries and different ages, besides those remedies which have a manifest action, physicians have used others, which though operating imperceptibly have yet been imagined to be of some efficacy towards conquering the disease. But as their practice was founded on the theory then prevailing, when that changed, so did the medicine; and this will probably be the case till the nature of a fever is better understood.

My first practice in every inflammatory fever was to blister, and especially in the advanced state when I believed that the patient could not bear any farther loss of blood. But afterwards, when I found that a solution of the fever was not to be procured by such means, I confined the use of blisters to those states of the disease in which I could be the most assured of their efficacy. Such was that of a headach, when not removed by the first bleeding and by opening the body; in this case a blister between the shoulders seldom failed of giving ease.

To the same place, though not with equal certainty of relief, a blister was applied, when the patient had a cough (which he generally had) or any other sign of inflammation in the lungs: but when he complained of a stitch in his side, the plaster was laid on the part affected. In these circumstances I likewise ordered some pectoral drink, and an oily mixture which shall be mentioned when I

come to the pleurisy. In a *delirium*, I followed that course which shall be laid down in the next chapter.

If the body was bound, I opened it (after the first bleeding) with some lenient physic; but throughout the course of the fever I found it sufficient to prevent costiveness by daily clysters*, if the patient had not otherwise regular stools. After recovery, some mild purge was often requisite, in order to prevent the too hasty repletion of the convalescents, upon indulging their appetite: cathartics at that time seemed otherwise unnecessary. But if the fever in the beginning was attended with gripes and a looseness, after bleeding I gave some rhubarb; and if the purging still continued, I endeavoured to check it by the chalk-julep only; and afterwards proceeded in the method as above.

Towards the *crisis*, or in the decline of the fever, a little wine was added to the panada, or given in some other shape, as the best cordial; and in great sinkings, I preferred some drops of spirit of hartshorn, in a tea-cup-full of white wine whey, to every other medicine of that intention.

After shewing that so much depends on early and repeated bleedings in the beginning of these fevers, and

* A motion or two daily, procured in this way, I have observed to be one of the best and most general remedies in fevers.

on blisters, I can offer no remark more useful than what relates to *opiates*; which otherwise one might be too apt to have recourse to, amidst so many complaints of pain, looseness, and want of rest. With regard to the two first, I have already proposed what I found sufficient for the cure; but as to the watchfulness, I shall observe, that opiates ought only to be used in the advanced state of the disease, when the inflammatory symptoms are much abated, when the head is not affected, and when the patient after long watching believes he should be well enough if he could but sleep. At such times, and especially at the *crisis*, and after it, I have usually given two scruples of the *confectio Damocratis* at bed-time, and with good effects. If the paregoric be continued, costiveness must be prevented by clysters or some mild laxative.

In these, as in other fevers, thirst was moderated by acidulating the barley water with vinegar, or by balm-tea with lemon-juice. And as to diet, the patient was always kept upon the lowest, such as panada, water-gruel, and the like, without allowing any broth till after a breaking and a sediment in the urine: when that happened, a decoction of the Bark, or the elixir of vitriol, completed the cure.

C H A P. II.

Observations on particular inflammations.

§ 1..

Of the inflammation of the brain.

THE *phrenitis* or inflammation of the brain, considered as an original inflammation, is properly a summer disease, when men are exposed to the ardour of the sun; and especially whilst asleep and in liquor. But a symptomatic *phrenitis* or *delirium* is one of the most general inflammatory symptoms, is confined to no season, and happens indifferently in the bilious, malignant, or inflammatory fever. It is more common in military hospitals than elsewhere, on account of the violence done to all fevers when the sick are carried in waggons from the camp to an hospital, where the very noise, or light alone, would be sufficient with more delicate natures to raise a phrenzy.

An original inflammation of the brain requires immediate, large and repeated bleedings; and the relief is thought to be the more certain if the blood be taken from the jugular. I have never advised cutting the temporal artery, finding so much relief from applying three

or four leeches to each temple after bleeding in the arm *. The benefit thence arising may be compared to the effects of an hæmorrhage by the nose. The rest of the cure consists in the medicines common to all inflammatory fevers.

The symptomatic *phrenitis* is also treated by opening a vein, if the pulse can bear it ; but if this cannot be done by reason of lowness, the cure is to be attempted by leeches and blisters. It is usual in blistering to begin with the head, but in military hospitals I found it convenient to leave that to the last ; because barbers are careless, and in cutting the skin expose the patient more to a strangury †. The common internal medicine was the diaphoretic powder mentioned in the last chapter.

A *phrenitis* is often brought on, or increased, in the hospitals of an army, by the want of due perspiration, and of warmth in the extremities. Therefore, as soon as a

* I have sometimes since applied six to each temple.

† Upon reading this passage in the first edition, Dr. WHYTT, professor of medicine in the university of *Edinburgh*, wrote to me, he had observed, that by shaving the head, twelve or fifteen hours before the application of the blister, a strangury was generally prevented. Sometimes I have found the brain sensibly relieved by cutting off the hair and shaving the head, though no plaster was applied : and since the first edition, I have in such cases, out of the hospital, given the *sal sedativum* of HOMBERG, to the quantity of 25 grains every four hours, and, as I have imagined, with good effect ; but as I never trusted to that medicine singly, I cannot speak of it with certainty.

foldier is brought into the house with feverish symptoms, his hands and feet should be washed with warm vinegar and water. And I would likewise recommend for the hospitals, what I have sometimes since in a *phrenitis* successfully used in my private practice, a fomentation to the feet and lower part of the legs with double flannels wrung out of water (with a seventh of vinegar) made agreeably warm, and repeated often for an hour or two at a time.

§ 2.

Of the inflammation of the eyes.

SOLDIERS are subject to an *ophthalmia* or inflammation of the eyes, not only from winter colds, but from their frequent exposition to the sun and dust during the campaign. The slighter cases may be cured without bleeding; but if any degree of fever be joined, or the inflammation be considerable, this evacuation ought not to be omitted. The greater inflammations are not to be cured without large bleeding, unless we can make a derivation from the part affected without draining the whole body. For this purpose, blisters are usefully applied behind the ears, especially if they are continued for two or three days, and if the sores are afterwards kept running. This part of the cure is sufficiently known. But what I have observed

observed to be sometimes more efficacious, though less generally practised, is bleeding by leeches; when two or more are applied to the lower part of the orbit, or near the external angle of the eye, and the wounds allowed to ooze till they stop of themselves. Therefore in all greater inflammations, after bleeding in the arm or jugular I have used this method, and repeated it more than once if required. The practice is no less proper in an inflammation of the eyes from a hurt or a blow: only in great fluxions, some blood is to be first taken from the arm, and immediately after, a revulsion is to be made by a brisk purge. But though these means are proper in the common *ophthalmia*, they are not to be relied on when the disease arises from a scrofulous, or a venereal cause *.

In all cases, we are to look often and narrowly into the inflamed eyes; since the inflammation may either be occasioned, or kept up by moats, or by hairs of the *cilia* falling in, or growing inwards, so as to cause a constant irritation.

* There are also inflammations and ulcers of the eye-lids, which are often mistaken for disorders of the eye itself, but are not to be cured by the common ophthalmic medicines. The following liniment, communicated to me by a friend who had given particular attention to this branch of medicine, I once found efficacious:

R. Unguenti albi 3 v. sacchari Saturni 3 i. quibus super porphyrite simul tritis insillantur balsami traumatici 3 ij.

Hujus paululum, linteo exceptum, oculo dolenti omni nocte imponatur.

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The flighter inflammations from the dust, or the sun, were removed by fomenting with warm milk and water, adding a small proportion of brandy; and by anointing the eyes with the *unguentum tutiæ*, or the like, at night. But in bad cases, after the inflammation had yielded a little to evacuations, I found the *coagulum aluminosum* of the *London Dispensatory*, spread on lint and applied at bed-time, the best external remedy. Till then the patient is to use a solution of white vitriol; or, in violent pains, to foment frequently with a decoction of white poppy heads.

§ 3.

Of the inflammation of the throat.

THE inflammatory *angina* is most frequent and dangerous upon the first encampment. Its tendency to bring on a suffocation requires speedy and large bleedings, purging, and blistering; but the method of using all these being so well laid down by *Sydenham*, I shall only mention another remedy which I have sometimes found useful. Let a piece of thick flannel, moistened with two parts of common sweet oil and one of spirit of hartshorn (or in such a proportion as the skin will bear) be applied to the throat, and renewed once in four or five hours *. By this

* This medicine I had from the late Dr. YOUNG, physician at *Edinburgh*.

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means

means the neck, and sometimes the whole body, is put into a sweat; which, after bleeding, either carries off or lessens the inflammation. The *formula* is new but not the whole intention; for the ancients applied warm oil with a sponge, and warm bags with salt *; and some later writers have recommended poultices made of the dung of animals †, which seems to be only a coarse and an offensive way of using the volatiles.

I observed little benefit from common gargles; for at that time I did not think of injecting them with a syringe, which now I constantly do. By this method, the patient brings away a great deal of tough phlegm, and generally finds some immediate relief, from clearing the glands of the *fauces*. My composition is thirteen ounces of barley-water (or sage-tea) with two ounces of *mel rosarum* and one ounce of vinegar; sometimes I have added a spoonful of mustard for a greater *stimulus*. The bleedings, the laxatives, the blisters, and this gargle are all the medicines I now find necessary. And even in the *angina maligna* or ulcerous sore throat, I lay the chief stress of the cure upon gargling in this manner. In all cases, I direct five or six syringefuls to be injected, one after another, as far into the throat as the patient can bear, and the medicine to be repeated three times a day ‡.

§ 4.

* CELS. lib. iv. cap. iv.

† ETMULLER. cap. de angina.

‡ In later practice, besides a blister to the back, in bad cases I have laid one across the throat; at other times I have applied 7 or 8 leeches under the *fauces*; and when
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§ 4.

Of the pleurisy and inflammation of the lungs.

THE pleurisy and peripneumony are the most frequent forms of our inflammatory fever. It is to be remembered, that in these disorders the pain may be felt in any part of the chest, behind or before, as well as in the sides ; and sometimes so low down, as to be mistaken for an inflammation of some of the abdominal *viscera*, such as the liver, spleen, or kidneys.

Before I enter into an inquiry how far the pleurisy and peripneumony are properly distinguished, I shall mention those remedies which I have used with most success in such pains of the breast, sharp or obtuse, as are attended with a difficulty in breathing, almost always with a cough, and never are without some fever. For we are not to confound these inflammatory pains, and difficulties in breathing, with some spasmodic stitches (which seizing the muscles of respiration are not accompanied with a fever, and may be removed by externals only) nor with certain flatulent pains of the side, if I may so call them, to which hypochondriacal and hysterical persons are most subject.

the patient has been brought low by the loss of much blood from the arm, I have opened one of the veins under the tongue, and taken away two or three spoonfuls: all these methods at times have had a good effect. But when an abscess is formed, which the lancet cannot reach, its breaking will be hastened by a common vomit.

Such cases indeed come rarely into these hospitals. But to the same kind of flatulent stitches every person is liable when brought low by sickness, and especially by any disorder of the bowels. These pains may be owing to wind confined, or to excrements pent up in that part of the *colon* next the diaphragm. They generally strike from the breast to the back, or from side to side, affect the breathing, and are sometimes attended with a short and frequent cough. But the fever and sickness of the blood, with other marks of a true pleurisy are wanting. Bleeding may do harm, but carminative laxatives, with warm applications to the part give ease. A blister perhaps is the only remedy common to both.

Although we reject the critical days, we must still with the ancients observe certain periods of the true pleurisy, distinguishable both by the symptoms and the indications of cure. The sick are often brought into the hospital when the inflammation has spread upon the lungs, and gone too far to yield to bleeding. Now, however improper it would be at this time to commit the whole to nature, yet certain it is, that if the *sputum* appears, as described by *Hippocrates*, we are to consider it as the means of cure, and therefore are not to divert it by bleeding or other evacuations.

With these cautions we are to proceed, letting blood freely for the first three or four days of the distemper;
but

but if in that time the spitting begins, the bleeding must either be wholly omitted, or so moderated as to relieve the breast, without impairing the strength or checking the expectoration.

With regard to the quantity, and repetitions of bleeding, no precise rules can be given. *Sydenham* has specified forty ounces for the whole quantity which men may, at a *medium*, lose in a pleurisy; but this, in our circumstances, would have been too little had it not been for blisters, which not only shortened the cure but prevented the loss of a great deal of blood.

A pleurisy, taken in the beginning, will often be cured by one large bleeding, and a blister laid on the side affected. The objection to this practice is founded on the stimulating quality of the *cantharides*; but the relief is so certain, that theory ought only to be employed here in accounting for the resolution of an internal spasm, or obstruction, by such a *stimulus* upon the skin.

This method of blistering the side is ancient, and was performed by *sinapisms* *; but now only *cantharides* are used, and the practice is become common in *Britain*. Some difficulty remains about the time of application, whether it is best to apply the blister in the beginning, or to wait till the pulse be softened by frequent bleeding. The ex-

* CELS. lib. iv. cap. 6.

perience.

perience which I have had induces me to prefer the former; for in treating great numbers in the hospitals, I found no inconvenience from using the blister immediately after the first bleeding, but, on the contrary, a more sudden and certain relief. Nay frequently, when the surgeon was not at hand, I have had the plaster put directly to the side, and the patient bled afterwards; being satisfied if the vein was opened before the *flies* had time to stimulate. These lateral blisters, as well as those for the back, were made as large as the palm of the hand with the fingers; a size unusual any where but in this country.

Although the symptoms may vanish upon blistering, it will be more secure to bleed again, unless a sweat comes on with a relief from pain, and makes this and other remedies unnecessary. But, if the lungs are much inflamed the cure cannot be so speedy; for though the first bleeding and blister should give ease, yet repetitions of both will be needful. Sometimes the stitch returns and fixes in the other side; but this being treated as the first, will also give way.

A distinction has commonly been made between the pleurisy and peripneumony, which I likewise followed in the former editions. But having since read the dissections and remarks of those celebrated authors *de Haller* * and *Morgagni* † relating to this subject, I am convinced that

* Opuscul. Pathol. obs. xiii. xiv.

† De Sed. & Caus. Morb. ep. xx. xxi.

we ought to consider these two distempers as one, in which the lungs are always inflamed, and often without the pleura; but the pleura never, without the lungs. Wherever the pain is, I apply a large blister to the part; and if there is no particular stitch, but only a general oppression, I lay the plaster between the shoulders; and afterwards, if the disease is obstinate, first to one side and then to the other. Blisters, not only when applied to the chest but also to the extremities, tend to relieve the breast, and to promote expectoration; whereas bleeding must be used cautiously, if at all, after the *sputum* appears.

Not only during the height of the inflammation, but throughout the state of expectoration, I give the patient from hour to hour a small tea cupful of a pectoral infusion warm *, and once in five or six hours, four spoonfuls of an oily mixture †. But when the expectoration flags, instead of this last medicine, I order as much of the *oxymel scilliticum* as the patient can take without sickness, or purging. Or, what I have often found more effectual, four spoonfuls once in six or eight hours of a solution of

* *Viz.* An infusion made of the ingredients of the *decoctum pectorale*; to a quart of which, add an ounce of the simple *Oxymel*.

† *R Mellis (vel syrupi ex althæâ) ʒvi. gummi Arabici in pulverem contriti ʒi. aquæ rosarum ʒii. accuratè subactis admisce invicem olei amygdalarum dulcium ʒiʒ. et aquæ puræ ʒvi.*

gum *Ammoniacum* *. I have likewise observed good effects from making the patient breathe over the steam of hot water: a practice recommended by *Boerhaave* and the *Baron van Swieten*, and confirmed to me by the repeated trials of *Dr. Huck*, who found it more beneficial when the phlegm was viscid, as well as more grateful to the patient, by adding a small portion of vinegar. This is my present practice. In the hospital, when the patient was reduced by repeated bleedings, I found the *sal cornu cervi* joined to *sperma ceti* not only proper for raising the pulse but for promoting expectoration †.

If notwithstanding this discharge, the patient complains much of a stitch, or labour in breathing, it is still necessary to bleed. But in this case there is danger of falling into one of these extremes; either of suffering the lungs to be overpowered, by omitting to bleed; or of hazarding the suppression of the *sputum*, by bleeding too freely. *Trillerus*, *Huxham*, and the *Baron van Swieten* have delivered the rules how to proceed here. But, with regard to blisters, there need be no caution at such a juncture, as they are always seasonable, whether for raising the pulse or relieving the breast.

* R *Spermatis ceti* (ex vitello ovi quantum satis est soluti) ʒij. lactis *Ammoniaci* ʒvii. syrupi *croci* ʒvi. misce.

† This is the formula which I have generally used:

R *Spermatis ceti* (ex vitello ovi soluti) ʒiii. aquæ puræ ʒvii. salis cornu cervi ʒi. syrupi balsamici ʒi. misce.

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In the course of expectoration, a vomit has sometimes contributed to discharge the viscid phlegm. Sometimes opiates may be given, but with caution ; for, as long as the pulse is hard, or the breathing difficult, or when watchfulness is owing to the fever, they do harm. But when the fever has ceased, and sleep is only prevented by a thin rheum falling on the *fauces*, or lungs, opiates, and especially if joined to squills, will both give rest and promote expectoration.

§ 5.

Of the inflammation of the liver.

THE liver is a part not only liable to original inflammations, but also to suffer by translations of matter. I have found by several dissections that this *viscus*, next to the lungs, is most subject to suppuration ; but I have known one case only cured after an abscess. In this, the matter pointing was let out, and the patient soon after recovered.

Another case occurred, remarkable for the situation of the abscess, which was intirely on the left side of the *linea alba*. The incision was nevertheless made, and a large quantity of *pus* was evacuated. The patient was relieved, but the operation having been delayed perhaps too long, he died soon after. Upon opening the body, the incision

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was

was found to have passed into the liver, but to have been too small for discharging all the matter.

A third case was singular for the flatness of the tumour, and an unusual difficulty in breathing; for the man could not lie extended, but for the most part rested in a prone posture upon his knees and hands. He had frequent retchings to vomit, with a constant and uncommon pain at his stomach and sickness; and two days before his death he grew yellow, and was seized with a hiccup. The body being opened, the liver was found wholly scirrhous, or purulent. The thick and posterior lobe was suppurated; and another large abscess rose from the concave part, which thrust the stomach outwards in such a manner, that had an incision been made before death, as in the former case, it must have passed through the stomach before it came to the bag.

As to the cure of an inflammation of the liver, I have made no remark that deserves notice; unless that with plentiful bleeding, one of the best remedies is a large blister laid over the part affected.

§ 6.

Of the inflammation of the stomach and intestines.

THE same method has been practised in the inflammation of the stomach and intestines: nor have I known these local blisters attended with any bad consequences,

quences, though applied early in the disease. In particular, they were useful in the *ileus* or inflammatory colic; and often answered in fixed pains of the bowels from spasms, without evident marks of inflammation.

To this observation relating to the effects of blisters in pains of the *abdomen*, I shall subjoin a few remarks upon the inflammation of the bowels, which have occurred upon further reflection and more experience.

The *εἰλεός*, *ileus* (improperly rendered *volvulus*) according to *Galen*, “ is an inflammation of the intestines attended “ with violent gripes, and such a constriction as to allow “ no passage for either the *fæces* or flatulence*.” This definition, where vomiting is not named, is nevertheless agreeable to the description of the *ileus* by *Hippocrates* †, who mentions both a bilious and a stercoraceous vomiting; but which he considers as additional symptoms when the distemper rises to a height. For, in the Aphorisms ‡ *Hippocrates* observes, that “ in the *ileus*, vomiting is a bad “ sign;” which seems to imply, that there may be an *ileus* without any vomiting at all. And *Aretæus* §, who of all the ancients has given us the fullest and most satisfactory account of the disease, takes notice of three degrees of it; one, in which the stomach is oppressed, without vomiting; another, in which the patient brings up phlegm

* Lib. De Definit.

† De Morb. lib. iii.

‡ Sect. vii. 10.

§ Acut. Morb. lib. ii. cap. vi.

and gall; and the third and fatal one, when he voids his excrements by the mouth. From this it appears, that whenever there are acute pains of the bowels, attended with an oppression at the stomach, great costiveness, and (if I may add from *Hippocrates*) a tension of the belly, of all perhaps the most constant symptom, without regarding whether there is vomiting or not, we may freely determine the case to be the *ileus* of the ancients; and from them draw what lights they can furnish with regard to the cure. But if, in conformity with some of the best of the moderns, we should only call that an *iliac passion*, in which the peristaltic motion is wholly inverted, our practice can receive no assistance from the *Greeks*, who supposed that state of the *ileus* to be incurable.

Thus *Sydenham*, when to the above symptoms even a vomiting of the food is joined, allows no other name to the disorder than that of the *passio iliaca notha* * as supposing in that case only a partial inversion of the peristaltic motion; and he considers the rendering of clysters by the mouth as the mark of a total inversion, and therefore a pathognomonic symptom of the true iliac passion: *quando liquet ex clysteribus per os ejectis et aliis signis verum esse ileum* †, &c. This *ileus verus* of *Sydenham* I never saw but once (the patient died) and I should imagine, that it has been but rarely seen in our times by those in the greatest

* Sect. i. cap. vi.

† Ibid.

practice, and seldom or never cured: so that it may seem extraordinary, that in his days it should occur so often as to satisfy him about the certainty of his method of cure; and the more, as the remedies which he used would now appear inadequate to much milder degrees of the disease. But, that excellent author appears to have been afterwards sensible of the insufficiency of his former practice; for, in the *Processus Integri* (his posthumous work) he omits part of it, and adds some more powerful remedies, which still perhaps, in other hands, would prove ineffectual.

As to all the lesser degrees of the *ileus*, we must look in *Sydenham* for their description and cure under the title of *colica biliosa*, which we may be the more certain is the same distemper with the *ileus*, as the author himself says, that if this colic was not timely remedied, it terminated in the *iliac passion* *. But it is to be wished that *Sydenham* had not given the name of *bilious colic* to the *ileus*, nor considered it in the light he has done; because upon his authority many have been led to correct, and to evacuate the bile (perhaps faultless) without sufficiently attending to the inflammation, as he does not mention it. *Sydenham* bleeds but once; from which circumstance alone we may judge, that he had never inquired how the bowels of those who died of the distemper appeared after death, nor apprehended any danger from a mortification, which

* Sect. iv. cap. vii.

from numerous dissections we are now assured is always threatened.

Having had these reasons to deviate from *Sydenham's* practice, I followed the more ancient one, of bleeding largely and often, as long as the violence of the symptoms remained, or whilst the strength permitted. If after the first bleeding, the patient was not sensibly better, in a few hours the vein was opened a second time, and immediately after, a blister (as large as the palm of the hand with the fingers) was applied over that part of the belly which was most affected. As I have more than once known the patient relieved in his bowels as soon as he felt the burning of his skin, and at the same time have stools by a purge or clyster, which had been given before without effect, we have reason to believe that the blister acts more as an antispasmodic than an evacuant. This was my common method in the hospital; and if since that time I have made less use of these blisters, it is not from having seen bad consequences from them, but from finding, in private practice, a greater reluctance in the patient to have them upon a part where they are not commonly applied; and also, from their somewhat interfering with the warm bath, which though a material article in the cure, was generally wanting in the hospitals of the army.

Next to bleeding, the principal part of the cure depends upon opening the body, which formerly I attempted by clysters,

clysters, and by giving every hour a pill of aloes, soap and calomel ; but afterwards I changed that practice for the more lenient medicines. In this intention, I have given, every hour, the size of a nutmeg of an electuary compounded of half an ounce of the *electarium lenitivum*, two drachms of the flowers of sulphur, and one drachm of the creme of tartar, with some syrup. But of late, I have kept more to the use of the *sal catharticus amarus*, recommended to me by Dr. *Heberden*, who had had several proofs of its good effects in small but repeated doses. Two ounces of this salt being therefore dissolved in a pint of water, I give two spoonfuls every half hour ; or one spoonful at shorter intervals, as long as the patient's stomach will bear it, or till he has had two motions. Although this medicine has a disagreeable taste, yet as Dr. *Heberden* remarked, the stomach will often retain it when more grateful liquors are rejected : a circumstance which might incline one to believe, what has been said of other neutral salts, that they possess some degree of a sedative, as well as a laxative quality. Whether I direct the electuary or this solution to be given, I order a clyster, purely loosening, for assisting the operation : for I never could understand, how parts lying in the center of animal heat, and naturally in a moist state, should be fomented by any fluid, in a clyster, no warmer than themselves. When I suspect that the obstruction is owing to hardened *feces*, at first I only use clysters of oil, but at all other times, the following :

℞ *Decocti communis pro clystere* ℥x. *electarii lenitivi*, *olei olivarum*, *singulorum* ℥ii. *misce*.

But when the stomach is so much disordered as to throw up either of the above laxatives, I then join some opium to a stimulating purge; a practice which has been long in use here and followed by Dr. Mead *.

℞ *Extracti cathartici* gr. xxv. *extracti Thebaïci* gr. iß. *mercurii dulcis sexies sublimati* gr. v. *misce, fiant pilulæ* x.

These are for one dose, to be given at some interval when the patient, after vomiting, complains of the least sickness. The smaller the pills are, they will have the better chance of being retained. About twelve hours after this, or when the force of the opium begins to go off, I endeavour to promote the operation of the purge by the solution of the salt as before; and in a few hours more, still continuing the solution, I repeat the clyster.

After procuring stools, most of the danger being over, I follow pretty nearly Sydenham's method, in regard to the rest of the disease; giving laudanum at bed-time; and in the morning, as much of the solution, or of some other laxative, as is sufficient to open the body freely till the hazard of a relapse is past.

Sydenham, in the *ileus* (as he defines it) recommends for the vomiting a scruple of salt of wormwood in a spoonful

* Monit. et Præcept. Medic. p. 114.

of lemon-juice, to be given in the act of effervescence; which practice I remember to have tried more than once successfully in iliacal cases, where the patient only vomited bile; but with this difference, that instead of giving the draught twice a day, I gave it every hour.

With regard to the causes of the *ileus*, it is well known that those who have ruptures are most liable to it; but such cases are not common in the army. As to other causes, there were too few instances to satisfy me about the most frequent. Not but that among soldiers the bowels are often inflamed; but every inflammation there does not tend to an *ileus*; for by falling upon the larger intestines it generally occasions a flux, as will appear by the dissections of those who died of the dysentery. A few examples may be found of the *ileus* from an inflammation of the *colon*; but I imagine that in most of them, some hardened *feces*, or some tumour, have concurred to straiten the passage and prevent stools. Upon the whole, I have met with this disease more in my practice at home, than abroad in the army. Children and those who are delicate are perhaps more liable to it than men in the vigour of life; besides such as have ruptures are not enlisted. A gouty humour may be often the cause among people of higher rank, but seldom or never among soldiers. I remember to have had two patients in the *ileus* attended with vomitings; one a young gentleman of two and twenty (who had lived intemperately) whose disorder went off with a

fit of the gout; and the other, a man of fifty, who in a few days after a second attack was likewise seized with the gout, and afterwards had no complaint in his bowels. Neither of these persons had been troubled with the gout before. But whoever desires to pursue this inquiry farther, may consult the *Sepulchretum Anatomicum*, *Ruyfch's* anatomical and chirurgical observations *, and the late excellent work of *Morgagni*, *De Sedibus et Causis Morborum* †.

I shall conclude with one remark, which though it has been made before, yet has not been so generally received as to render any further testimony unnecessary. The *ileus* is for the most part attended with a sensible degree of fever, and with all the other symptoms related above; but besides that there are cases, in which there is no vomiting (as shewn from the ancients) there are others in which the fever is scarce perceptible, when the patient feels little pain, and is not altogether costive. I say there are such cases of inflammation; because, when with symptoms so little alarming the patient has died, the bowels have been found not less mortified than after the most distinguishing marks of the disease. This, so far as I know, was first taken notice of by Dr. *Simson*, whose observation is quoted and confirmed by the *Baron van Swieten* ‡, and lately by *Morgagni* §, who observes, that in such circumstances, the

* Obs. 91.

† Ep. xxxiv. & xxxv.

‡ Comm. in BOERH. Aphor. § 371.

§ De Sed. et Caus. Morb. ep. xxxv. 22.

only prefages of danger are to be taken from the tension of the belly, and a dull pain upon pressing it, from the lowness and inequality of the pulse, and from a change in the countenance. What he says upon this subject well deserves attention.

§ 7.

Of the rheumatism.

THE ancients seem to have imperfectly distinguished the gout from the distemper now called the rheumatism, by giving the name of *arthritidis* to the affection of all the joints, whether the pain arose from a rheumatic inflammation, or a gouty humour. If not all, but some particular joint suffered, the distemper was denominated from the part; hence the terms *chiragra*, *podagra*, *ischias*, &c. all which they considered as *species* of the *arthritidis*. But as some arthritic pains were observed to be of a different nature from others, they distinguished them according to the different humours which they supposed to be the cause of the disease. Thus, one kind they believed depended on the blood, therefore bleeding was recommended as the chief remedy, and in plethoric habits they bled more than once.

Although by making this distinction, the ancients might sometimes treat in a proper manner that distemper now
X 2 called

called a rheumatism, yet as names are so apt to impose upon the understanding, it is to be imagined that the different kinds of the *arthritis* were often confounded, and consequently often unskilfully managed. Accordingly we find, that in later times the physicians came to consider all pains of the joints as the effects of a *rheum* or *catarrh*. But this change of theory had a worse consequence; for, all catarrhus humours being supposed to be of a cold nature, bleeding was forbidden, and the cure of an acute rheumatism, as well as of the gout, was then attempted without opening a vein. *Botallus* seems to have been the first who opposed that practice, and distinguishing the inflammatory *species* of the catarrh (or what we now call a rheumatism) from the rest, declared that repeated bleeding was necessary for the cure*.

But *Ballonius* is the first whom I find using the term *rheumatism*, to denominate this inflammatory *species* of the *arthritis*, which he also conceived to be different from either a gout, or a catarrh †. The same author is also the first who has described the disease in a proper manner, and who has recommended repeated bleeding for the cure. This method has been since followed by the best practical writers, and in particular by *Riverius* and *Sydenham*.

* De Curat. per Sang. Miss. cap. xii.

† We meet with the word *ῥευματισμός* in *GALEN*, but in the lax sense of *rheum* or *fluxion*, and not, so far as I know, to denominate any particular distemper. *BALLONIUS* begins his treatise upon the rheumatism by calling it *affectus pæne ἀνώνυμος apud antiquos*.

How frequently rheumatisms occurred, especially in the beginning of a campaign, was seen in the general account*; but we must add, that though this distemper sometimes appeared with all the feverity mentioned by *Ballonius* and *Sydenham*, it was generally of a milder kind. In a high degree of an acute rheumatism the joints are considerably swelled and inflamed, but in our fevers with rheumatic pains that was seldom the case, and therefore the cure was commonly completed in a few days, by twice or thrice bleeding, and by promoting a *diaphoresis* with the cooler medicines, particularly with vinegar-whey. But if the rheumatism was attended with acute pains, or swelling of the joints, the cure was chiefly to be obtained by repeated and almost daily bleedings, till the feverish heat and the pains were either intirely removed or made much easier. And in this course we may proceed the more safely, as those who are subject to this kind of rheumatism are generally in the vigour of life, and are either plethoric, or able to bear such evacuations. Add, that frequent bleedings weaken the body less perhaps in this disease than in any other.

If the pain and swelling of the joints remain after the fever is abated by frequent bleedings, apply three or four leeches to the part where the inflammation and tumour are the greatest, and let the blood ooze till it stops of itself. As the relief hereby obtained is sometimes imme-

* Part i. chap. iii. and chap. iv.

diate,

diate, and the evacuation but small, the repetitions need not be limited *. *Ballonius* also mentions this practice; and I have had sufficient experience to recommend it to others. But we are to expect little benefit from leeches in such pains of the joints as are not attended with both inflammation and swelling.

In the acute rheumatism internal medicines avail little. In such cases I have commonly given camphire, but not so as to force a sweat †. As to diet, it must be of the lowest kind, as *Sydenham* well advises.

Ballonius mentions paretics, but without defining the kind, or the times most proper for giving them. *Sydenham*

* I have sometimes, since, successfully used twelve leeches every day for three days together, and I make the application as soon as the parts begin to swell.

† Although we are not to force a sweat, it will be proper to keep up a gentle moisture on the skin; for which end I have used the camphire in this manner:

℞ *Camphoræ grana xii. amygdalas dulces, demptis pelliculis, ij. contritis paulatim adijce aquæ puræ ℥viii. ut fiat emulsiō, cujus colaturæ admisce spiritus volatilis aromatici guttas xl. syrupi croci ℥℔.*

Dentur quartâ vel quintâ quâque horâ cochlearia iv.

During the feverish heat I order a laxative clyster daily; but when the fever is off, or much on the decline, I give every night at bed-time about a scruple of gum *guaiacum* dissolved with the yolk of an egg, in a draught of plain water sweetened with sugar; by which means the patient has generally one or two loose motions next day. This method I continue, after leaving off the camphire, till he gets well. To the *guaiacum*-draught I sometimes add a few grains of salt of hartshorn to keep up a perspiration, without weakening its laxative quality.

condemns opiates, as fixing the disease; and, so far as I have observed, justly. Outward applications, excepting leeches, are also to be omitted as long as any fever or inflammation remains. The spirituous and volatile liniments inflame; and the emollient fomentations, though they give ease for a time, do harm by relaxing.

But the chronic rheumatism is one of the most obstinate disorders of the hospital; being either the remains of a rheumatic fever, or the continuation of pains that proceed at first from neglected colds. In complaints of this kind, if the blood be not fizy, we may suspect that the soldier either pretends indisposition, or that his pains are of another nature *. *Sydenham* has also described this species, wherein, though there be no fever, he recommends bleeding; which practice I followed, and often found efficacious. The patient therefore once in eight or ten days lost about eight ounces of blood, as long as it was fizy, or his complaints remained. Between whiles, I purged him with a solution of gum *guaiacum* in a larger dose than in the formula above; and on the intermediate days I gave him twice or thrice in the day 50 or 60 drops of the spirit of hartshorn in a draught of water. The tincture of *guaiacum* of the Dispensatory contains so

* In our hospitals, the rheumatic pains were always attended with fizy blood. This mark however of a rheumatism is not constant; as I have since seen persons with the same complaints, under no temptation to deceive, without any visible alteration in their blood.

little of the gum, that we must ascribe most of its virtue to the volatile salt.

This was my practice in the hospital ; but since that time having seen good effects from the gum *guaiacum* used only as a laxative, in these cases therefore I give it in solution, with five grains of salt of hartshorn, every night at bed-time ; and bleed or not as I see occasion.

When the joints are swelled and inflamed, leeches are to be used as before ; but when there is no inflammation, the aching parts are to be covered with flannel. In general I have found little benefit from any other external application, except leeches, or blisters. After the patient has continued some time in this course, his recovery will be quickened by the use of the cold bath, or the Bark * ; and to those who can afford it, riding is a specific remedy.

By this method I have found many cured : but I must acknowledge, that several slight cases in appearance, have withstood these and all other methods which I could think of. Sometimes venereal pains may be mistaken for rheumatic ; at other times the two may be

* Some physicians have given the Bark in acute rheumatisms (after plentiful bleeding) as soon as a sediment appeared in the water ; though some degree of fever remained, and the pains were still considerable. I have had some success myself in giving it so early, but have not seen cases enough to recommend the practice to others.

joined.

joined. A salivation does not cure a chronic rheumatism; but there are cases which will yield sooner, if once or twice a week we give a large dose of *Calomel* over night, and purge it off the next morning *.

Some of the more obstinate pains may be of that kind which *Sydenham* calls the scorbutic rheumatism; or others, more properly, the *arthritidis vaga* or flying gout. For though the common men, and especially at their time of life, very rarely have the true gout; yet, by irregularities, or diseases, the humours may tend that way without producing any regular fit. Of what kind those pains may be that are sometimes felt after ill-formed and obstinate intermittents, I cannot determine. *Sydenham* believes them to be owing to the Bark; but they were certainly taken notice of by *Ballonius* before the use of that medicine.

The sciatica of our hospitals is almost always of the rheumatic kind; and therefore, if recent, yields to bleeding, blistering upon the part, and *guaiacum*. But if the distemper is of a long standing, or the cause gouty, the matter will lie too deep for a blister, or any of the com-

* In obstinate cases, without fever, *RIVERIUS* recommends large and repeated doses of calomel joined to a purgative. *Prax. lib. xvi. cap. 3. & Observat. cent. iii. obs. 41.* And others have found the same preparation answer, in alterative doses, continued for some weeks. But, as the venereal pains are so often confounded with the rheumatic, it is perhaps chiefly in the former that the mercurials have been found so efficacious.

mon medicines. I remember two cases in the hospital, in which the pain was exquisite and constant, and nothing gave relief; so that the men, after growing hectic, and long pining, died in agony *. The late Dr. J. Clerk of *Edinburgh* acquainted me, that he had known obstinate sciaticas, both of the rheumatic and arthritic kind, cured by a long continuance of soap taken to the quantity of four or six drachms daily †.

* From other cases which I have seen since, I am induced to think that these men had a suppuration about the hip-joint.

† Since the two first editions of these Observations, I have used in the rheumatism (when there was no fever) Dr. DOVER's powder, giving for some nights about 20 or 25 grains of it at bed-time, with plenty of some warm diluting liquor, and laying the patient in blankets: for the composition, see the treatise called *The Ancient Physician's Legacy to his Country*.



C H A P. III.

Observations on coughs, and the phthisis pulmonalis.

WITHOUT entering into the general consideration of these disorders, I shall only take notice of such cases as I have found most frequent in the army.

Coughs and consumptions are properly annexed to inflammatory diseases. For, a recent cough from cold may be considered as the lowest degree of a peripneumony; and an old and neglected cough, as the beginning of a consumption.

Obstructions of the lungs are succeeded by tubercles and ulcerations. In the bodies which I dissected of those who died of the *phthisis pulmonalis*, I found the lungs adhering to the *pleura*, and full both of tubercles and ulcers.

We ought therefore to be careful in removing colds in the beginning. But this part belongs to the regimental surgeon, who is first applied to, and who may be assured that a cough is bad indeed when a soldier complains of it. The disease being of an inflammatory nature, bleeding is the chief remedy, which alone will frequently cure bad colds, whilst all other medicines may be ineffectual without it. Recent coughs, after bleeding, are softened

by a mucilage of linseed, by *sperma ceti*, or by any common sweet oil *.

When the obstruction is of a long standing, oily medicines are not only useless, but by relaxing the stomach may increase the disorder.

In older and more stubborn coughs, or in the first stage of a consumption, when the patient complains of pains in his side, constriction at the breast, or of hot and restless nights, I have trusted most to small but repeated bleedings, to setons, and to a low and cooling diet.

I have found these small bleedings not only beneficial in old coughs threatening consumptions, but also after hectic symptoms have appeared. The quantity of blood drawn was from four to seven ounces, once in eight or ten days, and sometimes a vein was opened after shorter

* I observed that the oils had a better effect when joined to a pretty large quantity of a volatile alkali :

R *Salis cornu cervi* 3℔ *solve ex aquæ puræ* 3vij. *dein admisce olei olivarum (vel amygdalarum dulcium)* 3i℔. *sacchari albi* 3℔.

Sumantur ter quaterve die cochlearia iv. agitatâ prius phialâ.

Besides this, the patient, if disturbed by his cough at night, took 6 or 7 grains of the *pilulæ Matthæi* at bed-time ; but since that time I have generally, in a draught at bed-time, joined to 15 or 20 drops of *laudanum* about 2 drachms of the *oxymel Scilliticum*, or half a drachm of *gummi Ammoniacum* (according to the degree of heat, or to the stomach of the patient) in order to correct the binding quality of the opium. The former of these compositions was communicated to me by the late Dr. J. CLERK of *Edinburgh* ; the latter, by Dr. SIMSON of *St. Andrews*.

intervals. It was observable that the patients never found themselves so much relieved on the first, as on the second or third night after bleeding. The blood was constantly fizy; but if it had been found in a resolved state, to have insisted upon taking away more would have been improper. Nor would I recommend this method for common practice without making great allowance for the strength of soldiers, nor without suiting the quantity of blood to be let to the condition of weaker patients. In habits naturally weak, or scrofulous, or when the patient has been long in a decay, bleeding, like all other means, will be ineffectual.

But I can more freely recommend from repeated trials the use of a seton, made in the side upon the part most affected.

In thirst, heat, and other symptoms, the signs of a putrid state of the humours, the ptisan is to be acidulated and the aliments ought then to be all of the aciescent kind. Butter-milk is particularly good. And, if possible, the patient ought to be confined to a milk and vegetable diet.

I have found nothing diminish the hectic fits so much as small bleedings and a cooling diet. Colliquative sweats are sometimes checked by lime-water, and sometimes by the *elixir* of vitriol.

In

In the advanced state of a consumption, we may distinguish two sorts of coughs, one caused by the ulcers, and the other by a thin rheum falling upon the *fauces* and *trachea*; which parts being then deprived of their *mucus* become sensible of any irritation: and this last kind is perhaps the most painful and teasing to the patient. The same medicines are not proper for both. For the first sort I have used the balsam of *Peru*, but did not find it more efficacious than the *copaiba*. Of this last I commonly gave about ten drops, twice a day, in a bolus of conserve of roses *.

The other kind of cough can only be palliated by in-craffants, and for that purpose I have commonly used the conserve of roses, and opium. The former is always safe, and otherwise well adapted to the nature of the disease, but of weak virtues; the latter is the most efficacious, but is to be given with caution, considering how apt it is to affect the head, to bind the body, and to obstruct expectoration. However, as these bad qualities are in some measure to be corrected by squills, as soon as the patient begins to complain of restless nights

* Having, since the former editions of this work, been so often disappointed in the effects of such balsams in this distemper, I have laid them all aside, and trust chiefly to small but repeated bleedings (when the patients can bear the loss of blood) to a total milk or vegetable diet, to a seton in the affected side, to country air and riding, and to the free use of acids when they complain of thirst and hectic heats.

from coughing, I have usually prescribed a draught with a drachm and a half of the *oxymel scilliticum* and fifteen drops of the *tinctura Thebaïca*, to be given at bed-time; and have increased the dose of each ingredient when there seemed to be occasion for it.

I never gave the Bark in any stage of the consumption, unless in the convalescent state when the lungs seemed to be free from obstruction *.

Riding and asses milk, the two common resources, are wanting in military hospitals: what is still worse, the air of such places, or of full barracks, is contrary to the cure. Hence it happens, that though these means may often succeed with men better accommodated, they will generally be frustrated by the foul steams the sick breathe there: and though a soldier may chance to escape their bad effects and recover, it is odds but he relapses, by being exposed to colds as soon as he returns to his duty.

In this manner I have treated the *phthisis pulmonalis*. I have likewise observed much benefit to arise from small and frequently repeated bleedings in the cure of wounds, when matter has been absorbed, and a hectic fever brought on.

* I have frequently, since, given three or four spoonfuls once or twice a day of a decoction or an infusion of the Bark, without observing it to heat, or obstruct the breathing; but on the contrary, to have a good effect when the patient has complained of low spirits and weakness, and has not been in the last stage of the distemper.

C H A P. IV.

Observations on the fevers called bilious, or the autumnal remitting and intermitting fevers of the army.

I COME now to consider those putrid diseases, commonly though perhaps improperly called bilious *, which being the most common and fatal to an army, and least known, shall therefore be treated of in a more full and regular manner than the preceding.

The bilious disorders begin about the decline of summer, and become epidemic in autumn, appearing earlier, more general, and with worse symptoms, in proportion to the heat of the season, and to the moisture of the ground and climate. Although of different forms they are of a like nature, and may be reduced to two heads, *viz.* fevers and fluxes.

Beginning with the fevers, I shall first describe that which is frequent in every camp; next, that which seems more peculiar to the marshes; in the third place, I shall inquire into the cause of both; and then compare them with those of other places in the like circumstances: lastly, I shall propose the method of cure which I followed both in the fevers of the camp, and in those which occurred in the marshy parts of the *Netherlands*. In the

* Why so called, see part ii. ch. i. part iii. ch. iv. § 3.

next chapter I shall mention such remedies as I found most successful in removing the obstructions occasioned by these distempers.

§ I.

Of the symptoms of the remitting, and intermitting fevers of the camp.

IN the month of June, the fevers in the camp are fewer and less inflammatory than upon first taking the field; and as the season advances they are attended with still less inflammation, but with more disorder of the stomach and bowels, and with pains in the head; and they have all a sensible remission. This change, just perceptible after the solstice, becomes manifest by the end of summer, or the beginning of autumn.

This epidemic differs according to the nature of the ground, and therefore I shall distinguish it into two *species*; one, incident to an army on dry ground; and the other, infesting it in damp and marshy countries. I shall first describe the former.

The bilious or remitting fever of the camp begins with chilliness, lassitude, pains of the head and bones, and a disorder at the stomach. At night the fever runs high, the heat and thirst are great, the tongue is parched, the

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head

head aches violently, the patient gets no rest, and often becomes delirious; but generally in the morning, an imperfect sweat brings on a remission of all the symptoms. In the evening, the paroxysm returns, but without any cold fit, and is commonly worse than the former: next morning it remits as before. These periods go on daily till the fever, if neglected, changes insensibly into a continued form. Sometimes loose stools carry off the fit and supply the place of sweats.

Although this fever in many particulars resembles an intermittent, yet it is somewhat of a different nature, as shall be more fully shewn when we come to the cure. In the camp we seldom meet with a regular intermittent either in a tertian or quartan form, unless in the case of a man who was ill of one before he took the field.

The remissions usually appear from the beginning, and especially if the patient is bled on the first attack: sometimes they are little perceptible for the first two or three days. Hæmorrhages of the nose, at the height of the paroxysm, generally bring on the remission sooner and make it more complete. Vomiting or purging have the like effects. But I remember no natural evacuation making a cure at once, unless when a *cholera* supervened, that is, a violent discharge both ways of the corrupted humours which seemed to be the cause of the disease.

The fits are seldom preceded by shiverings, or any sense of cold, after the first attack. The pulse is full and quick during the paroxysms, and in the remissions it still indicates some degree of fever. The blood is florid, the *crassamentum* is firm, in a large quantity, and sinks in the *serum*. The blood shews no great sign of inflammation in the beginning of the epidemic, but towards the end of the campaign it acquires a fizy crust; for by that time, to the other symptoms are joined either stiches, rheumatic pains, or a cough.

Whilst the weather continues warm, the marks of a foulness in the *primæ viæ* are most frequent; but as winter approaches, the inflammatory symptoms prevail.

The urine is high coloured and crude till some evacuations have been made, and then it begins to break. What is voided by vomiting, or by stool, is generally of a bilious and corrupted nature. Costiveness not only often precedes but accompanies the disease, and when that happens the belly feels hard, and the patient complains of wind. Although all do not vomit, yet every one feels a disorder at the stomach, especially during the hot weather.

Worms come away frequently by stool, sometimes by vomiting. They are of the round kind, and those who are troubled with them have more obstinate gripings, or sickness at the stomach. In such cases, stiches are fre-

quent; but these being often of the flatulent kind are not always relieved by bleeding.

Some grow yellow as in the jaundice. This colour was observed to be more frequent during the first campaign than afterwards: it was an unfavourable, but not a mortal sign. One of the regimental surgeons told me, that he had opened the body of one of his men who died with this symptom, but had discovered no *calculus*, nor any kind of obstruction in the gall-bladder or in the biliary ducts.

The infantry was more subject to the fever than the cavalry; and these last, more than the officers: this seemed to be owing to the difference of clothing and accommodations *.

There were no critical days, nor any certain duration of the distemper, which was longer or shorter according to the manner of treating it. It could not be called dangerous, when timely and proper means were used; but this fever is often fatal to an army, when so many are seized at once as cannot be properly attended; or when it changes into a continued or malignant form, either by neglect at first, or by crowding too many who are ill of it into the same hospital.

This remitting fever attended every campaign, and was most frequent and fatal after the hot summers of

* Part i. chap. iii.

the years 1743, and 1747; but in the campaigns 1744, and 1745, the seasons being temperate fewer were seized, and the cases were milder.

§ 2.

Of the symptoms of the remitting, and intermitting fevers in low and marshy countries.

THIS *species* of the putrid fever was mentioned in the general account of the diseases most incident to the *Netherlands* *, and also in the account of those which occurred during the two last campaigns †; but the full description was reserved for this place.

We are first to observe, that though all moist countries are subject to intermittents, yet if the moisture is pure, and the summers are not close and hot, the fevers will mostly appear in a regular tertian form and be easily cured. But if the moisture arises from stagnating water, in which plants, fish, and insects die and rot, then the damps being of a putrid nature not only occasion more frequent but more dangerous fevers, which oftener appear in the form of quotidians, or double tertians, than in that of single ones. These marsh-fevers are not only apt to begin with little remission, but after intermitting

* Part i. ch. i.

† Part i. ch. vii. and viii.

for some days, to change again into continual fevers of a putrid and malignant nature. It is remarkable how much they vary with the season; for however frequent, violent, or dangerous they have been in the decline of summer, or beginning of autumn, when the putrefaction is at the height, yet before winter they are reduced to a small number, become mild, and generally assume a regular tertian form.

The worst kind were observed to prevail near the inundations in *Dutch Brabant**; the next, were those of *Zealand*†; of the third degree, were those in the lines of *Bergen-op-Zoom*‡; and the mildest sort, were such as were most frequent in the cantonments around *Eyndhoven*§, in villages rendered moist by plantations, and subterraneous water, but that not putrid. I shall describe the first and worst kind, from which it will be easy to judge of the nature of the rest.

In the end of July 1748, when the troops had been a fortnight or three weeks in the cantonments, whilst the days were sultry, but the nights cool and foggy¶, several of the men (of those regiments which lay nearest the inundations) were seized at once with a burning heat and a violent head-ach; some feeling a short and slight chilliness before the attack, others mentioning no pre-

* Part i. ch. viii.

† Ibid. ch. vii.

‡ Ibid. ch. vii.

§ Ibid. ch. viii.

¶ Ibid. ch. viii.

ceding disorder. They also complained of intense thirst, aching of the bones, a pain of the back, great lassitude and inquietude, frequently of a *nausea*, sickness, or a pain about the pit of the stomach, and sometimes they vomited green or yellow bile of an offensive smell. The pulse upon the first attack was generally depressed, but rose upon bleeding. There were some instances of the head being so suddenly and violently affected, that without any previous complaint the men ran about in a wild manner, and were believed to be mad, till the solution of the fit by a sweat, and its periodic returns, discovered the true nature of their *delirium*.

Some time after, Dr. *Stedman*, then surgeon to the *Greys*, acquainted me: “ That two of the men who were first
“ taken ill were seized at once with symptoms of an ar-
“ dent fever, and though they were speedily and plenti-
“ fully bled, yet, in an hour after, both were in a high
“ *delirium*, which continued for some hours and then
“ went off with a profuse sweat, under which all the
“ other symptoms either abated or vanished. That next
“ day about the same hour the paroxysm returned, and
“ in six or seven hours ran the same course. That in this
“ manner the fever affected many of that corps, whilst
“ some of them had less distinct paroxysms, the hot fits
“ longer, and those followed by imperfect sweats and little
“ relief. That sometimes the remissions were so imper-
“ ceptible,

“ ceptible, that the disease appeared almost in a conti-
“ nued form. That the nearer it approached to this last
“ state it was the more intractable; but that when the pa-
“ roxysms were distinct, with an intermission of some
“ hours between them, the patients for the most part did
“ well, however great the *delirium* was during the fever.
“ That a few returns of the paroxysms reduced their
“ strongest men to so low a condition as to disable them
“ from standing. That some became at once delirious
“ without any previous complaint, and would have
“ thrown themselves out of the windows, or into the
“ water, if not prevented; that their phrenzy continued
“ for some hours, after which falling into a profound
“ sleep, they awaked quite sensible but with a violent
“ head-ach. That others, whose fever appeared in a
“ continued or remitting form, had critical sweats about
“ the ninth day, and afterwards regular paroxysms and
“ intermissions. That a few had a *crisis* by stool, or urine.
“ That there were some who were ill about three weeks
“ without any sensible remission, after which the fever end-
“ ed with some quotidian paroxysms, and that these men
“ during their illness had gentle sweats, or rather a con-
“ tinual moisture upon the skin. That many upon being
“ first taken ill had bilious vomitings; and that several void-
“ ed round worms both ways. That the profuse sweats
“ had always a putrid smell; and that the discharge
“ from the blisters was so offensive, that the nurses de-
“ clined

“clined dressing them. What was most remarkable, a
“few of those who died were observed to have a regu-
“lar pulse, though very near their end. That all those
“who died had a cadaverous smell for some days before
“death, and immediately after, livid spots and other signs
“of a mortification.” Dr. *Stedman* concluded with observ-
ing, that “the same distemper was also common among
“the peasants of the cantonments in the neighbourhood,
“and that a great number of them died.”

This account of the beginning of the epidemic being
so full and distinct, I need only add, that it agreed with
the observations of all the other regimental surgeons in
the like situation, allowing for some variation according
to the different circumstances of those corps. Thus Mr.
Lauder, surgeon to the *Inskilling* regiment, then Lord *Rothes's*,
informed me, “that most of the men were first taken ill
“upon their return from forage: For, the regiment be-
“ing cantoned upon the right and left of *St. Michel's Gestel*
“ (their principal quarters) close upon the inundations *,
“and many of the quarters being above two leagues from
“*Bois-le-duc* where the magazines were kept, the men
“were obliged to set out about four in the morning, in
“order to get back before the greatest heat of the day.
“That at this early hour the meadows and marshes on
“each side of the road were covered with a thick fog of

* Part i. ch. viii.

“ an offensive smell, which he considered as the chief
“ cause of the sickness. For though the party generally
“ returned before noon, that several among them were al-
“ ready in a fever, and some actually delirious ; nay, that
“ a few on their way home were so suddenly taken with a
“ phrenzy, as to throw themselves from their trusses into
“ the water, imagining they were to swim to their quar-
“ ters. That from the first attack, as many of them as
“ were sensible complained of a violent head-ach, thirst,
“ and burning heat ; and that all of them, attempting to
“ sit up, were ready to faint away with a giddiness, sick-
“ ness at stomach, and retching to vomit. That these fe-
“ vers were for some days of a continued form, or at most
“ had slight remissions ; after which they either remitted
“ more plainly, or thoroughly intermitted. That at first
“ the pulse was small and depressed (though the patient
“ was then delirious) but that it always rose upon bleed-
“ ing.” Mr. *Lauder* told me, about three years after this
sickness, that two of those men, who were so suddenly
taken with a phrenzy on their return from foraging,
though they recovered of their fever, had ever since been
epileptic ; and that all the rest, who had been ill, were
still liable to returns of an intermitting fever.

The condition of the foot was somewhat different, for
few of them being cantoned near the inundations, their
fevers though frequent were generally of a milder na-
ture ; yet some of those corps had the sickness also in a
high

high degree, occasioned by the moist and corrupted air of their quarters. The village of *Dintber* * lay low, and was furrounded with ditches and thick plantations. Mr. *Tough*, surgeon to the battalion there, observed: “ That
“ the meadows were every evening overspread with a fog,
“ which continued till next morning after sun-rise, and
“ which had the offensive smell of a foul ditch newly
“ drained. That the men were commonly taken ill in
“ the night-time with a shuddering or sense of cold, which
“ was soon followed by a violent head-ach, intense heat,
“ and other feverish symptoms †. That at this time the
“ pulse was so small and depressed, that if a vein was
“ opened the blood at first would scarce run out, but that
“ after some vent it flowed briskly, and then the pulse
“ rose. That a profuse sweat succeeded the heat, and
“ with that a remission, or intermission of the fever.
“ That the paroxysms returned every evening, and if care
“ were not soon taken to stop the fever, it was apt to
“ change into a continued form with malignant symp-
“ toms. That in three cases he observed petechial spots;
“ and in a fourth, a mortification under the left breast,
“ which however was cured by the Bark. Lastly, that

* Part i. ch. viii.

† It is to be remarked, that the dragoons having better pay generally hired beds of their landlords, or at least lay warm in their cloaks; but that the foot soldiers wanting these advantages, lay in barns and other damp places without any covering.

“ there was one instance of a man, who being suddenly
 “ seized with the usual head-ach, and not immediately
 “ bled, got out of his quarters and ran about the fields
 “ like one distracted.”

In the greatest heat of the weather and rage of the distemper, most of these fevers answered the description of the καύσος or ardent fever of the ancients, which *Hippocrates* does not rank with the inflammatory diseases of the winter and spring, but with the bilious epidemics of summer and autumn *, though later writers have applied this term to all fevers attended with great inflammation.

But it was observable, that even in the worst parts of that country, as soon as the weather cooled in the decline of autumn, the fevers began to assume a milder form; and in the end of the season, differed little from the common intermittents of other places.

There were but few quartans, and those did not appear till late, nor were they hard to cure unless when they suc-

* Aphor. lib. iii.

The ardent fever of the ancients was either continued, or remittent; of which last GORRÆUS gives the following description: *Est δ καύσος tertianæ febris ὁμογενής, ut qui ab iisdem causis, eodem anni tempore & iisdem corporibus provenit, a quibus & tertianæ febres excitari solent. In tertianâ intermittente primùm rigor, deinde ἀπορροή ἐστ: verùm ardentis exacerbationes nullo cum rigore fiunt, nec unquam integrè solvuntur, sed modicè tantùm remittuntur.* Vide Definit. in voce Καύσος.

ceeded

ceeded to some other form of this fever, which had already produced obstructions in the *viscera*.

When the sickness was at the worst many voided round worms, which were not the cause of the fevers, but, as we observed before, concurred with other circumstances to retard the cure.

At the height of the epidemic it appeared, that both intermittents and remittents, by extending or doubling their paroxysms, frequently changed into a continued, putrid and dangerous form, and that most of those whom we lost died in this way. These men, as we remarked, had a corrupted smell for a day or two before their death, and soon after it their bodies mortified. Some had petechial spots, though the place where they lay was neither crowded with sick, nor too close; and to these spots were added some other symptoms, the same with those of the hospital-fever.

But in general, the mortality was not in proportion to the number of the sick, nor to the alarming nature of the symptoms. Although the distemper was violent, yet it yielded to medicine, and no kind of acute disorder seemed to require it more; for a great number of the country people perished for want of it, whilst most of our men recovered by the care of their regimental surgeons. Of the *Greys* and *Rothes's* dragoons, who were the most sickly, 31 died in all; which will not appear a considerable number,

ber, if we reflect what a multitude of bad cases there were (and those much dispersed) and how few to attend them *.

One of the most unfavourable circumstances was the proneness to a relapse, the danger of which was greatest during the hot weather, less in the decline of autumn, and least of all after the frosts began. But in the following spring, relapses became so frequent that those regiments, who had served in *Zealand* in the preceding autumn, had in the next campaign above four times more sick than any other corps in the line.

Frequent relapses brought on visceral obstructions, which made the intermittents more obstinate and irregular, and terminate in a dropsy, or jaundice. In this bad state of the *viscera*, a hard tumour was frequently felt on the left side of the belly lower than the false ribs called by the common men the *ague-cake*. But as none of those who died with this tumour were opened, the part affected could not be ascertained. I conjectured it to be the spleen. It was often accompanied with swelled legs, a distention of the whole belly, or with some other hydropical symptom; and whilst it remained, the fits could not be safely stopped by the Bark. It was a bad but not a mortal sign, since many who had it recovered.

* Part i. chap. viii.

I likewise met with a few cases of the *tympanites*, a distemper which I suspected to be chiefly owing to a premature use of the Bark before proper evacuations. But as to other obstructions, and in particular those which brought on the *ascites*, I observed that they happened as often without, as with the Bark, and therefore seemed generally to depend on the long continuance and obstinacy of the intermittent.

It was remarkable, that whilst the sickness raged among the common men, it appeared in a mild degree among the officers, who seldom had the fever in a continued form, or attended with malignant symptoms, but in the shape of single and double tertians, or of quotidian remittents. The reason seemed to be, that they were less exposed to the sun and fogs, that they had drier quarters, better diet, and the use of wine.

§ 3.

Of the causes of the remitting and intermitting fevers of the camp, and those of low and marshy countries.

THE heat and moisture of the air appear to be the chief *remote* and *external cause* of these fevers; and this cause is most prevalent not only in proportion to the warmth and closeness of the weather, but to the quantity of vapour with which the air is loaded in the drought of summer.

summer. Rains in general lessen the moisture of the air by draining it of so much water; and by descending from a colder region, they not only refresh the atmosphere but the earth also, and thereby check immoderate exhalations. The most healthful campaigns have therefore been those in which the heat and moisture of the air were moderated by frequent showers. But if the air in its greatest heat receives not only the aqueous, but the putrid *effluvia* from marshy grounds, or from any large surface of corrupted water, the remote and external cause of sickness will be aggravated, the diseases will be more numerous and attended with more alarming symptoms.

The relaxation of the fibres and greater tendency in the humours to putrefy, consequent on this state of the atmosphere, may be considered as the *internal* and *predisposing cause* of these fevers. For, a hot and moist air unbraces the solids, resolves the blood, and obstructs perspiration. When the air is filled with vapour, it admits the perspirable matter with difficulty; and when part of that is retained, the blood not only thereby receives a septic ferment, but is more heated by having less evaporation. Nor can the want of a free perspiration be supplied by sweating, as sweating tends to weaken the body and render it more subject to disorders.

Although these two causes may be sufficient of themselves to produce this fever, yet for the most part a third

is wanting to bring on the disease: this is called the *exciting* or *occasional cause*, which always arises from some error in the *non-naturals* such as heating the blood by fatigue, intemperance, or insolation; or by suddenly checking the perspiration by improper food, wet clothes, lying on wet ground, &c.

To these last errors in regimen *Sanctorius* must allude, when he refers the causes of the autumnal tertian fevers to a stoppage of perspiration; and we can scarce doubt of the justness of that observation, though from *Keil's* Tables it would seem that this excretion may not only be diminished, but for some time wholly suppressed without any injury to the health. But we are not to compare the ordinary checks given to perspiration in this country (where the weather is seldom close and hot for any considerable time) with what happens in other climates subject to such intemperature, where the inhabitants having in summer and autumn long and uninterrupted heats (and by that means blood of a more putrescent nature) require a more constant evacuation of what is recrementitious. *Sanctorius* himself says, "that such a stoppage of perspiration as in summer might occasion a malignant fever, will in winter scarce affect the health *."

* *Adiapneustia, quæ æstate malignam febrem, hyeme vix minimam alterationem efficere potest: corpora enim acriori perspirabili æstate referta sunt quam hyeme.*
Med. Stat. sect. II. aphor. xxxv.

Thus far we have endeavoured to trace the *remote*, the *predisposing*, and the *occasional causes* of these fevers, and it were to be wished that with the same probability we could explain their *causa proxima* or *immediate cause*, that is, could shew how these vitiated humours act upon the vital principle, so as to excite a fever of a remitting or intermitting form, accompanied with such symptoms as were mentioned above. But in these researches, as so much depends upon the action of parts which have laws peculiar to themselves and are imperfectly known, it seems better not to form an *hypothesis* at present, but to wait till further discoveries be made in the animal oeconomy.

These fevers have been long called *putrid*, and not without foundation; since, from what we have observed, there seems at this time to be such a predisposition in the humours to putrefaction. They have still more anciently been distinguished by the name of *bilious*, but with a more disputable propriety; as the first authors did not confine that term to the appearances only, but extended it likewise to the *cause* of the disease. Yet it was no wonder that the ancients should believe that these fevers arose from bile, when they observed that nature cured them by a *cholera* or violent discharge of the gall both ways; and that physicians could also succeed, in the same manner, by a vomit and a purge. But after all, the bile seems

to be more the effect than the cause; for whenever these fevers come to fair intermissions they give way to the Bark, a medicine which so far as we know has no direct influence upon that humour. All therefore that can be said in favour of the ancient doctrine is, that though the bile be not the first cause, yet, from its redundance and depravation, owing perhaps to the fever, it frequently becomes a secondary cause of irritation and supports the disease.

I should now proceed to the cure, but as it may be proper to examine these principles, by considering what form the summer and autumnal disorders assume in other places, under the influence of a warm, moist and putrid air, I shall produce a few instances for this purpose from such authors as seem to have made the proper observations.

§ 4.

The remitting and intermitting fever of the camp and cantonments compared with the summer and autumnal fevers of other places.

I SHALL begin with the *morbus Hungaricus*, a disease frequently mentioned by authors, but, as I imagine, not thoroughly known. It is described as a malignant fever, attended with sickness at the stomach, a pain and hardness about the epigastric region, great thirst, a parched

tongue, and a constant head-ach ending in a *delirium*. These were the common symptoms, to which were generally added petechial spots, or blotches. This distemper was contagious and mortal, though it usually run out from 14 to 20 days. It was first taken notice of in the year 1566, in the Imperial army in *Hungary*, and from thence it spread over a great part of *Europe*. As I have read no author who was an eye-witness, I shall take the liberty to infer from this account, which we have from *Sennertus* *, that the *Hungarian* disease was a compound of the bilious and hospital-fever, taking its rise in the camp, but acquiring that high degree of malignity from the foul air of the places in which the sick were crouded. It appears that the climate there is one of the worst for an army in the field; which is easily understood, from the cold and damp nights that succeed the sultry days in a marshy country †. And since the autumnal fevers and fluxes are
more

* De morbo Hungarico.

† The moisture of that country is to be understood only of such low parts of it as lying upon the great rivers, particularly the *Danube* and *Drave*, are exposed to frequent inundations. For, the land-floods form marshes, and these corrupting begin to infect the air about the end of summer. The rest of *Hungary* is said to be dry and healthful; but the campaigns being always made near those rivers, the troops on that account have been generally sickly.

Dr. BRADY, physician-general to the *Austrian* army, who served three campaigns in *Hungary*, informed me, that upon the drying up of the inundations, he has seen large tracts of those grounds swarming with aquatic insects; and he confirmed the above account of the moisture of the air, and of the remarkable difference between its temperature

more frequent and worse in *Hungary* than elsewhere, in order therefore to account for the great mortality and pestilential nature of this epidemic, we need only suppose that the weather in that year was more than ordinarily unwholesome throughout *Europe*, that the sick were crowded together, and that the dead frequently lay unburied *. But these reflections will be better understood after considering the nature of the jail or hospital-fever, to which class this disease may in part be referred. We shall therefore proceed to examine some other epidemics of a less doubtful nature.

At *Copenhagen*, in the year 1652, a fever began in autumn after an unusually hot and dry summer †. That city

perature by day and by night. Now, the sudden changes from heat to cold are not only to be ascribed to the damps (the air after sun-set being always colder in proportion to its moisture) but, according to that gentleman, to the winds blowing from the *Carpathian* mountains, which are some of the highest in *Europe* and constantly covered with snow. These lying at so great a distance, he supposed that the stream of air from that quarter was in the day-time thoroughly heated before it could reach the camp, but which could not happen after sun-set.

Dr. BRADY also told me, that the description here given of the bilious fevers of the marshes agreed with the observations which he had made of the autumnal fever incident to the Queen's troops in *Hungary*, not only with regard to the symptoms, but to its cure by the Bark, which he, the first of any *Austrian* physician, had given in that distemper. And he added, that the course of the other military diseases, both there and in *Bohemia*, had been similar to what he found (by reading the first edition of these Observations) had occurred in our campaigns in *Germany* and in the *Low-Countries*.

* This very circumstance is mentioned by SENNERTUS, vid. loc. cit.

† BARTHOLIN. *Histor. Anatomic. Rar. cent. ii. hist. lvi.*

is situated in a low and moist country. The fever was accompanied either with quotidian or tertian paroxysms, with bilious vomitings, a burning heat, violent head-achs, often with a *delirium*, and with petechial spots which came out in the fits and disappeared in the remissions. These spots, with an extraordinary debility, shewed the malignant nature of the disease, which was further ascertained by the fever's ending in profuse sweats, abscesses, a *diarrhœa*, or dysentery. The author of this account, *Thomas Bartholine*, upon dissecting the bodies, and finding the stomach and *duodenum* always inflamed or mortified, assigns to these parts the seat of all malignant fevers.

In the year 1669, a like fever raged at *Leyden*, described by Professor *Sylvius de le Boe* *, who lived at the time, and practised there. The situation of this place is also low and damp. The spring and beginning of summer were cold, but the remainder of the summer and the autumn were unusually hot, with little or no rain, and with a constant calm or stagnation of the air. The water of the canals and ditches was highly corrupted, and the more so, as the author observes, by an inlet of salt water mixing with the fresh †. The air being thereby rendered more impure brought on an epidemic fever of a remitting, or intermitting form, and very fatal. Besides a disorder of the

* *Prax. Med. append. tract. x.*

† The reasons of this may be learned from the experiments in the Appendix, paper iii. and iv.

stomach,

stomach, great anxiety, bilious vomitings, quotidian or tertian paroxysms, and other symptoms the constant attendants of this illness, he mentions spots, oozing of blood from the nose and hæmorrhoidal veins, dysenteric stools, putrid urine, great debility, *aphtæ*, and other appearances which argued an uncommon resolution and putrefaction of the blood. And yet, which is strange, *Sylvius* ascribed the cause to a prevailing acid*, and treated the distemper accordingly: so that we cannot help remarking, that the great mortality among the principal inhabitants of that city (of which, he says, two thirds died) might have been owing, in some measure, to the method of cure by absorbents and other medicines, agreeably to the notion which that ingenious and learned man and his followers entertained of its cause.

These and other instances of the same kind may confirm what was observed before, of the danger arising from hot and dry summers to moist and low countries †.

But the putrid diseases are still more frequent and fatal in the marshy countries of the south, where the heats are longer and more intense. In some parts of *Italy*, and in other tracts of the same latitude, these fevers have appeared with such dangerous and putrid symptoms, as not only to have been called pestilential but confounded with

* SYLV. Prax. loc. cit. DCXXVII.

† Part i. ch. i. Part ii. ch. i. § 2.

the plague itself. In this sense we are to understand *Celsus* *, in the terms *pestilentia* and *febris pestilentialis*, which he describes as peculiar to the *grave anni tempus* and the *graves regiones*. His meaning is, that the bilious and malignant fever is the disease of the latter part of summer and of autumn, when the air is thickest and most foggy, and that it is most frequent in low and marshy countries.

Rome was always liable to these fevers. *Galen* calls the *hemitritæa* the epidemic of that city, and speaks of its moist air †. Nay, in the beginning of the republic, before the *Romans* seem to have been aware of the noxious effects of stagnating water, or at least before they knew how to let it off, that place appears to have been so very sickly, that from the beginning of the state to the year U. C. 459, I find fifteen plagues mentioned by *Livy* ‡, which yet, from other circumstances, appear to have been only so many malignant and destructive epidemics occasioned by the putrid *effluvia* from the neighbouring marshes. But when drains and common sewers were made, *Rome* became more healthful, and then only the low and wetter places of *Latium* remained sickly. Afterwards, when the city fell into the hands of the *Goths*, the drains being stopped and the aqueducts cut, the *Roman* territory became

* CELS. De Medicin. lib. i. cap. x. lib. iii. cap. viii.

† De Temperam. lib. ii.

‡ LANCISIUS reckons up several more from the same author: vide *Dissert. de Advent. Rom. Cæli Qualit. cap. iii.*

one continued marsh, which for a series of years occasioned an incredible desolation *. And though these evils have been since remedied, yet still, by neglecting to draw off the stagnating and corrupted water (after inundations of the *Tyber* succeeded by great heats) the malignant remitting, and intermitting fevers become both general and fatal. The dissections made by *Lancisus*, added to his excellent account of those epidemics, are a full proof of their putrid nature †.

Although it does not appear that the countries in which *Hippocrates* practised were either marshy or subject to inundations, yet we find him frequently mentioning these fevers as common in summer and autumn, and as prevailing most when wet springs with southerly winds were succeeded by hot and close summers. A remarkable constitution of this kind is described in his *Epidemics* ‡, at which time the diseases were ardent, remitting, and intermitting fevers of a bad kind, attended with fluxes, parotids, and eruptions of a pestilential nature.

Prosper Alpinus observes, that the stagnating canals at *Grand Cairo* breed every year a malignant kind of small-pox, as also the putrid and pestilential fevers that prevail in March, April and May, which the southerly winds make the hottest months in that country §. He also re-

* Id. loc. cit.

† De Nox. Palud. Effluv. lib. ii. epid. i. cap. vi.

‡ Lib. iii. § iii.

§ De Med. Ægypt. lib. i. cap. xiv.

marks, that the pestilential fevers are both epidemic and fatal at *Alexandria* in autumn after the recess of the *Nile*. They begin with a *nausea*, great sickness at the stomach, extraordinary inquietude, and a vomiting of an acrid bile*; and many have bilious and putrid stools. Now, as these distempers rage in both those cities every year, it is not surprising, if in seasons uncommonly hot and moist they should be raised to a true plague. For, though the learned author asserts, that the true plague is not properly indigenous in *Egypt*, but is brought thither from *Greece*, *Syria*, or the more southern parts of *Africa*, yet he thinks that it may sometimes begin there after extraordinary inundations of the *Nile*, when the water, extending itself beyond the usual drains, stagnates and forms some large putrid marshes †.

Java, lying between 5 and 10 degrees of south latitude, is so near the line, that the seasons are not so properly divided into summer and winter, as into the dry and the rainy. The rains begin in November and continue till May, in which time an immense quantity falls. There are also a great number of marshes and canals with stagnating water at *Batavia*, and by their exhalation the air is rendered moist, foggy and unhealthful. *Bontius* observes, that at this time the humidity is great, and that even in

* The author's phrase is *bilis virulenta*.

† Ibid. cap. xv.

the dry months the metals rust*, and the clothes rot in that country sooner than in any part of *Europe*. Nevertheless, the plague is unknown in *Java*, though from these circumstances one might expect that this island should be greatly exposed to it. But we are to consider, that when the sun is most vertical in that country, it is also most clouded; by which circumstance, and the continual interchanges of the sea and land-breezes, the heat of the air is moderated, and its stagnation in a great measure prevented. The distempers are the *cholera*, flux, and a continued putrid fever. This last comes on suddenly with a *delirium*, and is attended with constant watchfulness, a vomiting of bile of various colours, but chiefly green. The extremities grow cold, whilst the inward parts burn, and the thirst is excessive; but the fever comes soon to a *crisis*. The evacuation of the first passages is the principal part of the cure; and next to that, the author recommends saffron†, a powerful antiseptic as well as a cordial medicine‡.

* The rusting of metals is perhaps only an ambiguous sign of moisture in any place near the sea within the tropics. For, I have been told by a gentleman, who made the experiment in *Jamaica*, that though iron rusts very soon in that island, yet that salt of tartar seemed to attract moisture from the air more slowly there than in *Britain*. I imagine therefore that the speedy rusting of metals, in hot climates, near the ocean, is owing to the great exhalation of the spirit of salt, which flies off from the sea-water by means of the heat.

† BONT. Method. Medend. cap. xiv.

‡ Append. Paper II. exp. xi. Paper III. exp. xvi.

The *British* settlements on the *Gold-coast*, in *Guinea*, are as near the line on one side as *Java* is on the other. In that country, the rainy season begins about the end of April and continues till past the middle of June; from that time the weather is cold for the climate, and the air very moist, from the exhalation of so much rain. During this cold season, remitting, and intermitting fevers with quotidian paroxysms are epidemic. These fevers are accompanied with great thirst, with a *nausea* and inquietude, and frequently with a vomiting and purging of putrid bile; nor do they usually abate till that is evacuated. If a discharge of that humour is not made in time, the distemper assumes a continued and malignant form, the pulse sinks, and a *delirium* comes on, which is generally fatal. Fluxes are likewise frequent at this season; and both fever and flux are not less common on board the ships lying off the coast, than on shore, but do not affect such as keep out at sea beyond the limits of the foggy air. The sea and land-breezes here, with the haziness of the weather during the hot season, seem to be of the same use as at *Java* for preventing pestilential diseases*.

Nor do the bilious fevers of the *West-Indies*, though of a putrid nature, ever turn to a plague; because the same kind of breezes prevailing there, may prevent that degree of stagnation and corruption of the air which is

* This account of *Guinea*, I had from persons of observation who had lived some years in that country.

neceffary to produce it. But the heats being great, and the atmosphere loaded with vapours, fevers of remitting and intermitting forms, with bilious vomitings, become epidemic throughout June, July and Auguft (April and May are always rainy months in *Jamaica*) and rage moft after the wettest feafons. Thefe fevers are incident to the natives as well as to ftrangers. But the new-comers are liable to a more putrid and a more dangerous fever, or rather to a higher degree of this bilious diforder, which, though not confined to any certain time of the year, moftly coincides with the former. This laft is diftinguifhed by vomitings of matter, fometimes green or yellow, at other times black and bloody, but chiefly by the yellownefs of the fkin, which gives it the name of the *yellow fever*. The blood is fo much refolved, that before death it enters the fmalleft veffels and tinges the *faliva*, and the *ferum* difcharged by a blister *.

The

* DR. WARREN (in his treatife concerning the malignant fever in *Barbadoes*) mentions feveral other fymptoms indicating a putrefaction of the humours, and nervous fpafms confequent thereupon. This ingenious author appears however to have miftaken the nature of the yellow fever, by referring it to the peftilential clafs of difeafes: but though he died young, we are informed that he was fenfible of his error, and had he lived longer, would have corrected it. By DR. HILLARY'S Account, we can fee a fimilarity in the fymptoms, and in the treatment, with the bilious fevers of other hot climates. But, upon this article I received the moft fatisfaction from DR. HUCK, who having been upon the expeditions to the French and Spanifh iflands, in the late war, made the following remark upon the paragraph above: " Even in the moft ardent and worft kinds of the yellow fever, I think a paroxyfm " may generally be perceived once in four and twenty hours; for the patient is com-
monly

The result of the whole is, wherever the greatest causes of putrefaction exist, there also will be seen the greatest number of remitting, intermitting, or bilious and putrid fevers.

Before I conclude, it may be proper to take notice, that we have also fevers of a bilious kind in *Britain*; and that

“ monly worst towards the evening, or at night. And if the yellow fever was to
 “ be distinguished, in its beginning, from the common remitting or intermitting fe-
 “ ver which was so fatal to our army, it was only by all the symptoms running
 “ higher, and by a greater degree of the fever when one might have expected freer
 “ remissions. Both fevers began with nearly the same symptoms; sometimes,
 “ though rarely, with a shivering. But whenever the fever ran high with burning
 “ heat, violent pains of the head and loins, profuse sweats without relief, redness
 “ and burning pains of the eyes, inflamed countenance, watchfulness, anxiety, op-
 “ pression and burning pains about the *præcordia*, frequent vomitings of green or
 “ yellow bile, or (what I think was rather worse) a constant retching to vomit with-
 “ out bringing up any thing, or vomiting the drinks only, one might then almost
 “ certainly foretel the yellowness; and if this appeared on the second, third, or
 “ fourth day, the disease was generally mortal. I have often seen patients labouring
 “ under most of these symptoms immediately relieved by early evacuations, and
 “ the fever brought to intermit. Nay, I have more than once seen this fever with
 “ all these symptoms carried off by bleeding and exhibiting, within a few hours from
 “ the first attack of the disease, a medicine which operated pretty briskly both by
 “ vomit and stool; and I have known some of these very patients, who were so
 “ well as to go abroad on the second or third day after, and who continued well
 “ for four or five days, but on committing some error, such as exposing themselves
 “ too much to the sun, were again seized with the same symptoms, and died on the
 “ fourth or fifth day, with their skin tinged of a deep yellow or copper-colour.
 “ Hence I am apt to think that these are different degrees of the same disease, and
 “ that it sometimes depends upon the manner in which the patient is treated in the
 “ beginning, whether he shall have the yellow, or only a remitting or intermitting
 “ fever.”

both

both our remitting and intermitting fevers, and dysenteries, seem no less owing to a putrid cause than those of other countries. But I must add, that such is the dryness of the soil, and its freedom from marshes, the constant perspiration, and the moderate and interrupted heats of our summers, that unless in extraordinary hot and close seasons, and in marshy places, these distempers are mild, and scarce ever epidemic.

In fine, during the latter part of summer, or throughout autumn, there seems to be in most places a tendency, more or less, to these remitting, and intermitting fevers, or to some disorders of the first passages, connected with a resolution of both the fluid and fibrous parts of the body. And this holds chiefly in hot and moist countries, and in all camps, for the reasons already given *.

§ 5.

Of the cure of the remitting, and intermitting fevers of the camp, and of those of low and marshy countries.

I COME now to the cure, in treating of which I shall observe the following method. In the first place I shall distinguish the two *species* of fevers as before, and then I shall mention such remedies as I have found most successful in them.

* Part i. ch. i. Part ii. ch. ii. § 2.

The cure of the camp-fever depends chiefly upon evacuations and a low diet; neutral salts and diluting acid liquors * are assistants; and the Bark is useful when there are complete intermissions.

I found it necessary to begin with opening a vein, and to repeat the bleeding according to the urgency of the symptoms. The vernal and latter autumnal remitting fevers are accompanied with pleuritic and rheumatic pains, from the coldness of the weather, and on that account require more bleeding. A person unacquainted with the nature of this disorder, and attending chiefly to the paroxysms and remissions, would be apt to omit this evacuation, and to give the Bark prematurely; which might bring on a continued inflammatory fever. A vein may be safely opened either during the remission, or in the height of a paroxysm. For, besides that I have observed the remission to come sooner and fuller after an hæmorrhage, I have repeated experience of the safety of bleeding in the hot fits; and not only in this, but in the marsh-fever, even after it had come to almost regular intermissions. In order therefore to make *Celsus's* maxim † consistent with this practice, we must interpret his term *impetus febris* in the sense of that chilliness or cold fit which preceded the hot

* The barley-water was acidulated with a little vinegar; and in the convalescent state we assisted the Bark with the elixir of vitriol.

† Quòd si vehemens febris urget, in ipso impetu ejus sanguinem mittere, hominem jugulare est. De Med. lib. ii. cap. x.

one in the fevers which he describes; for then bleeding would indeed be improper. But as the paroxysms of our fever, after the first attack, were without any coldness, his caution was not to be minded; nor any other except the common one, of not bleeding during the sweat.

Since the first two editions of this work, having had more opportunities of seeing these fevers, I found it the best course to give a purge, at any time of the day, immediately after bleeding, and the rather as the patient was then generally costive:

R Infusi senæ communis ℥i. electarii lenitivi ℥ss. nitri puri ℥i. tincturæ senæ ʒvi. misce.

The half only was taken at once, and if it did not move him twice in four hours, which generally it did not, he then took the remainder. This potion agreed with the stomach, purged plentifully and with ease, and therefore was a more useful than elegant composition. Next morning (when there was almost always a remission) I gave one grain of tartar emetic, rubbed to a powder with 12 grains of crabs-eyes, and repeated the dose in two hours, if the first had little or no effect; at any rate, in four hours. This medicine not only vomited, but generally opened the body and raised a sweat. By these evacuations, the fever generally became easier, and was sometimes quite removed. Some of the regimental surgeons had made the

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first

first trials with these small doses of the emetic tartar; but having seen the operation, as they gave it with diaphoretic antimony, prove too rough, I changed that part of the composition for the crabs-eyes. Formerly, instead of this powder, I gave in the first remission after seeing the patient, a scruple of ipecacuanha with two grains of emetic tartar, in one dose. But though this often succeeded, yet upon comparison I preferred the method above-mentioned, *viz.* first purging, and then clearing the *primæ viæ* with small doses of the antimonial preparation. This medicine I usually repeated next day, or the day following; if not, I opened the body with some mild laxative or a clyster, and continued this method till the fever went gradually off, or intermitted.

I have been since confirmed in my good opinion of this practice, by the account which Dr. *Huck* gave me of his success in such fevers, both in *North-America* and the *West-Indies*, by a method similar to mine. In the beginning, he let blood; and in the first remission, gave four or five grains of ipecacuanha, with from half a grain to two grains of emetic tartar: this medicine he repeated in two hours, taking care that the patient should not drink before the second dose; for then the medicine more readily passed into the bowels, before it operated by vomiting. If after two hours more, the operation either way was small, he gave a third dose, which commonly had a good effect in carrying off the bile; and then the
fever

fever either went quite off, or intermitted so far as to yield to the Bark. On the continent, he found little difficulty after the intermission; but in the islands, unless he gave the Bark upon the first intermission, though imperfect, the fever was apt to assume a continued and dangerous form. Dr. *Huck* never varied this method, except upon a stronger indication to purge than to vomit; in which case, he made an eight-ounce decoction, with half an ounce of tamarinds, two ounces of manna, and two grains of emetic tartar; and dividing this into four parts, he gave one every hour till the medicine operated by stool *.

As I did not begin to use the emetic tartar, in small and repeated doses, till the late war (and then only during three encampments in England) I had in those easy campaigns too few opportunities of trying this practice, so as fully to satisfy me that it was the best; but partly from what I saw myself, and heard from the regi-

* Since the last edition of this work, DR. HUCK told me: "That in the highly bilious or *yellow fever* of the *West-Indies* (where the stronger vomits, if not administered very early in the disease, are thought to be hurtful, but where nevertheless it seems necessary to cleanse the *primæ viæ*) he preferred this medicine. For, that though the first or second dose of it generally excited some degree of vomiting, yet in three or four hours it also purged; and that this last operation he endeavoured to keep up, by giving from time to time two or three spoonfuls more, until an evident remission appeared, which was usually on the fourth or fifth day from the beginning of this disease. That he watched attentively for this remission, and upon its first appearance began to give a decoction of the Bark, in as large and as frequently repeated doses as the stomach could bear."

mental surgeons, I imagined it was the most likely to succeed, even before Dr. *Huck* communicated his observations. I have been informed since, that in other countries, in such fevers, the chief medicine after bleeding is this antimonial preparation, given from a quarter to half a grain, three or four times a day, throughout the disease; in which dose it is not intended to puke, but to evacuate the bile by stool, and which it does with more certainty when assisted by clysters.

The neutral salts were given after the evacuations, in order to bring the fever sooner to a *crisis*, or to regular intermissions. The saline draughts made with lemon-juice being too costly for common hospital practice, instead of that acid, we saturated the salt with the spirit of vitriol; but since that time, for the same intention, I have preferred the *elixir vitrioli acidum*, as in this formula:

R *Salis absinthii* ʒi. *elixiris vitrioli acidi* ʒij. *vel quod satis sit ad saturationem, aquæ puræ* vi. *aquæ cinnamomi simplicis* ʒi. *syrupi e corticibus aurantium* ʒß. *misce.*
Dentur quinquies vel sexies die cochlearia iv.

I come next to the Bark, and shall observe, that these fevers have often such fair remissions, and even with a breaking in the water, as might persuade a physician unacquainted with their nature, that they would always yield to that medicine; but he would be often disappointed. Whether it be that some inflammation hinders the Bark
 from

from taking effect, or that these quotidians are not true intermittents (as not being of a tertian or quartan form) certain it is, that they can be seldom safely stopped by it. For, though the paroxysms have disappeared under its use, yet having so often seen the breast affected, or a lurking fever remain after giving the febrifuge, at last I made it a rule to attempt the cure without it; or at least to delay giving any, till in the convalescent state the patient required it only as a strengthener. And indeed there seems to be the less occasion for the Bark here, as by bleeding once or twice, clearing the *primæ viæ* by the purge and the emetic, and afterwards by keeping the body open, the paroxysms commonly lessen daily till they quite disappear. But whenever I found that the distemper was not likely to take that turn, but that in spite of the evacuations, the fits became worse (which was often the case in the *marsh fever*) I then had recourse to the Bark; and when it was most wanted, I have generally had the satisfaction of seeing it most effectual. As the intervals between the end of the sweats and the beginning of the subsequent paroxysms were very short, in order to have the more time to give the Bark, I began to administer it two or three hours before the sweat ended. In general, we may consider the feverish paroxysm as over, when the thirst and heat have ceased, and the patient finds himself in a profuse and easy sweat. But if ever the fever ap-
peared

peared in a tertian or quartan form, after the usual evacuations the Bark was a sure remedy.

The Bark answered best in substance with *Rhenish* wine, after standing a night in infusion; but for common use it was made into an electuary, in which, to each ounce of the powder a drachm of *sal Ammoniacus* was sometimes added.

This was the practice in the beginning of the fever, and also in its remitting and intermitting state. But if the disease was neglected in the first stage, or if after remissions or intermissions it changed into a continued fever, a vein was opened, if the pulse could bear it; but at any rate, if the head was affected with pain or *delirium*, leeches were applied to the temples, and a large blister was laid between the shoulders. At this time, neither strong vomits nor cathartics were given; but gentle pukes, repeated clysters, or some lenient purges were administered: the chief rule to be observed was to clear the *primæ viæ*.

But though a sweat was then the proper *crisis*, we abstained from the *serpentaria*, volatiles, and other heating medicines, unless when the pulse sunk, and the *petechiæ* or the like bad symptoms appeared; in which case it was necessary to use some of the warmer alexipharmacs, and to treat the disease like, what it was in effect, a malignant fever*.

* Chap. vii.

Sometimes the fever changed into a dysentery, which was treated in the manner directed in the following chapter. But if a *diarrhœa* came on, though that was never to be stopped suddenly, it was often found proper to restrain it gradually, and to promote a *diaphoresis* *. Although a looseness was the least favourable *crisis*, yet if nature pointed that way (by colic-pains, or a tension of the belly, attended with a dryness of the skin) it was necessary to procure stools by clysters, or some mild laxative (such as an infusion of rhubarb with manna) repeated according as the patient could bear the evacuation.

II. The *camp* and *marsh-fevers* are not more alike in their symptoms than in their cure. The rules therefore laid

* If the first passages have not been sufficiently cleared in the beginning, and the body kept open during the course of the fever, we can expect no other *crisis* than by a looseness, which therefore is not to be stopped as long as there is strength to bear it. But if there has been no omission at first with regard to the evacuations, or if the patient is too much weakened by the flux, after a little rhubarb, let him take twice a day the following bolus :

R *Theriace Andromachi* ʒi. *radicis ipecacuanhæ in pulverem contritæ* gr. ii. *vel* iii. *cretæ preparatæ, quantum satis est. misce.*

This medicine, with the proportion of the ingredients varied occasionally, I have known effectual in checking the purging, and bringing a salutary moisture upon the skin. But when the looseness could not be moderated by this bolus, I then ordered the following mixture :

R *Extracti Thebaïci* grana ii. *terantur ex julepi e cretâ* ʒxvi.

Dentur post alternas sedes liquidas cochlearia iv.

This is my common astringent mixture, which, upon comparison, I have observed to be fully as efficacious as the common one with the *confectio Damocratis*, and more agreeable to the taste and to the stomach.

down

down in the preceding paragraphs being applicable to both, I shall only offer a few cautions concerning those points wherein they seem most to differ. When the fever of the marshes is of an ardent-kind, it may seem to require large bleeding; but in general as the humours have here a more putrid tendency than common, this disease admits less of bleeding than the camp-fever, in which, by frequent and great colds, the blood becoming fizy fixes the inflammation. However, in most cases it was necessary to open a vein, either upon the first attack, or the next day if there was no intermission. But repeated bleedings, unless upon evident marks of a fixed inflammation, were so far from producing the desired effect, that they were apt to render the fever more obstinate. It ought also to be remarked, that the rule about bleeding regards the army only, and not the inhabitants of the *Low-Countries*, as having constitutions different from those of our men, who were not only young but robust and sanguine. And even amongst the soldiers, bleeding was seldom necessary upon a relapse, or after the weather grew cool, as the fever appeared then without inflammation, and as a regular intermittent.

I observed that vomits were still more efficacious in the marshes than in the camp; in so much that when a large quantity of bile was evacuated by an emetic, the fever would often be removed at once. But this was not to be obtained by the ipecacuanha alone, which I have seen have a

contrary effect, in making the subsequent paroxysms longer and more violent than the preceding; whether that was by acting weakly, and sending more of the corrupted humours into the blood than it discharged from the *primæ viæ*, or from some other cause, is uncertain*: for this reason I added two grains of the emetic tartar.

The marsh-fever, during the hot season, being more apt to run into double paroxysms, or to change into a continued form, than to remain regularly intermittent, it was necessary, after due preparation, to stop it in the first fair intermission. And for this purpose the Bark was found to be no less specific in those parts than at home. But I must add, that though large quantities were given, relapses were not only frequent but certain, if the medicine was not repeated more frequently than the soldiers could generally be prevailed upon to take it: so that upon the whole, the Bark was less useful than might have been expected. But observe, that no bad consequence arose from repeating it often. For, the visceral obstructions, which succeeded to these fevers, were not to be imputed to that medicine, but to a long continuance of the disease, or to frequent relapses; against which there was no security, unless the patient took an ounce of the powder once every ten or twelve days, throughout the autumn. The most effectual

* I had twice experience of this effect of the ipecacuanha by itself in my own case.

way to make a foldier continue the ufe of the Bark, is to mix it with equal parts of brandy and water*.

The next means of prevention depend on a proper diet. The convalefcents muft eat moderately, efpecially of greens and of fruit, and are to abftain from new fmall-beer, and whatever is flatulent or tends to relax. In general, whatever produces fuch effects difpofes the ftomach to indigef- tions, and thereby to a corruption of the humours; and, on the other hand, whatever braces proves antifeptic. A moderate ufe of fpirits is at this time neceffary; but as a foldier's pay is infufficient for providing both wholefome food and ftrong liquor, the public fhould make, on fuch occafions, an allowance of fpirits to the army, as it does to the navy, though perhaps half that quantity might be fufficient.

For the round worms, which fo often accompany thefe fevers, I commonly gave half a drachm of rhubarb with twelve grains of calomel, without obferving any inconve- nience from fo large a dofe of mercury, which with us was always duly prepared. Such anthelminthics as act flowly, and do not purge, feemed to have little chance for doing-fervice here, as the fymptoms were generally fo ur-

* I have fince obferved, that the fureft way of preventing a relapfe in thofe who unwillingly return to the ufe of the Bark, is to give four or five ounces in powder, as faft as the patient can be prevailed upon to take it: this quantity he may finifh in fix or feven days.

gent as to require some quicker remedy. For, though these animals will sometimes lie long in the bowels, without creating much uneasiness to a person otherwise well, yet in a fever, especially one of a putrid kind, the worms being annoyed by the increase of the heat, and the corruption of the humours in the *primæ viæ* (consequent on the fever) begin to move about and struggle to get out. *Lancisius*, who makes this remark, adds, that some of the bodies being opened of those who (at *Rome*) had died of such a bilious fever, they found wounds in the intestines made by the biting of the worms: nay, that some of them had even pierced through the coats of the guts, and lay in the cavity of the *abdomen*. In our hospitals, no dissection of that kind was made, but I have known many cases in which the worms escaped by the patient's mouth, though there had been no previous retching to bring them up. But, without advancing so far, they will occasion some very alarming symptoms. I remember, a soldier was brought to the hospital, about the end of summer, ill of one of these fevers, but with a more than usual disorder in his stomach and bowels not yielding to the common evacuations; the muscles of his face were strangely convulsed, and he was so restless that he could not lie for a minute in the same posture. At first I did not suspect worms, but in a day or two after, the patient having voided a round one by stool, I then gave him the powder above mentioned, which, either upon the first or second dose, brought away several

more : after this, the extraordinary symptoms ceased, and he soon got well.

I shall conclude this subject with an extract of a letter which I received from Dr. de Monchy of Rotterdam, who, during the time of my service, was physician to the Dutch troops which then made part of the allied army. This gentleman, after perusing one of the former editions of this work, favoured me with some remarks upon it ; and among others, with what follows, upon the bilious fevers. This was the more acceptable, as my learned friend had not only had the same opportunities with me of seeing these distempers in the camp, but also in his private practice, both before and since the war, in his own country, where they are more numerous and of a worse kind than in Britain. These are his words: *Sic ceteræ observationes meæ a tuis parum vel nihil differunt, nisi fortè quòd venam secandi (raro saltem) non tantam in febribus biliosis necessitatem invenerim; imò naturam imitando, præcedente emetico, subinde vomitum excitando (prout magis minùsve ad superiora materia turgeret) et levem, sed per dies aliquot protractam diarrhæam eccoproticis efficiendo, feliciter sine ullâ aliâ notabili criticâ evacuatione centenos curaverim; et adhuc quotannis, tempore autumnali, optimo cum successu et brevi curen.*

Quoad tempus vomitorio utendi, Boerhaavium aliosque præcticos secutus sum, dando illud tribus vel quatuor horis ante paroxysmum, in eâ continuò permanens opinione, quòd major tunc sit materiæ morbosæ accumulatio

accumulatio et aëritas ; et postea major subactio, et faciliior per urinam evacuatio.

Simplex hæc fuit mea semper methodus curandi febres biliofas cum oris amaritie, nausæa, vomitu, &c. dum ægri adhuc in primo initio morbi versabantur.

Quantocyus in continuis, vel parum tantum remittentibus, æquè tempore vespertino quàm matutino præscribebam vomitorium ex pulvere ipecacuanhæ scrupulis ij. et tartari emetici granis ij. et statim horâ post hujus remedii finitam operationem, ut purgans, cremorem tartari ad unciam i. ex lacte ebutyrato assumerent ægri sedulo curabam. Hæc postero die, si eadem fomitis adessent signa in primis viis, imò et tertio die iterabam. Si verò febrem, ut et pleraque ejus symptomata imminuta videbam, alvum tantum laxam servare conabar simplici decocto hordei et tamarindorum cum nitro.



C H A P. V.

Observations on the obstructions consequent on the remitting, and inter-mitting fevers of the camp, and those of marshy countries.

A LONG continuance of these fevers, or frequent relapses into them, brought on visceral obstructions ending in a dropfy, or a jaundice.

The dropfies seemed to be chiefly owing to obstructions of the liver and spleen, in which case the watery swelling generally began at the feet and rose gradually to the belly.

But when the belly alone was swelled, and that suddenly, after the unseasonable use of opiates in the dysentery, or of the Bark in intermittents, the *colon* then became distended with air, and the distemper was a true *tympanites*. Such cases indeed did not often occur; but when they did, they yielded to the following remedies. If there was any degree of fever, I began with bleeding, and gave the common saline mixture, with rhubarb*; but if there was no fever, a few grains of the *species aromaticæ* were joined to the laxative; and the patient drank some strong camomile tea. Every night at bed-time, till the tumour disappeared, I gave fifteen grains of rhubarb, or as much as

* See page 204.

was sufficient to procure one or two stools the next day. When the swelling gave way, if the pulse was flow, and if there was no thirst, without omitting the rhubarb, I endeavoured to strengthen the bowels, by an electuary of camomile flowers and ginger, with a small proportion of steel.

All strong phyfic, and carminatives without laxatives were hurtful.

A man, who had been some weeks ill of this distemper and was feverish, died suddenly in the night time, upon his belly subsiding all at once, after three or four loose stools occasioned by taking some squills. The body being opened, neither air nor water were found in the cavity of the *abdomen*; but the *colon* was so large and relaxed, that it seemed to have contained air enough to have been the cause of the tumour. This case suggested the use of a swathe in such disorders; as the patient may thereby always make a compression suitable to the decrease of the air in his bowels.

The *ascites* comes on more slowly, and is generally attended with anasarcaous swellings, and a paucity and thickness of urine. Sometimes the intermittent goes off when the swelling begins; at other times it continues, or comes and goes in an irregular manner. I observed that these dropsies were not to be cured by purging alone, nor by soap, nor mercurials;

mercurials ; but chiefly by the lixivial salts, either in the form of broom-ashes, salt of wormwood, or salt of tartar. The common method was this : about forty grains of salt of wormwood (or of tartar) were dissolved in about ten ounces of an infusion of the *absinthium vulgare*, to which were added about two ounces of the spirit called *Holland-Gin* ; and this mixture was taken at three draughts and repeated daily. The patient had no other medicine, except, once in four or five days, half a drachm of *pilule ex colocynthide cum aloë* for a purge ; and in the decline of the disease, some common chalybeate. Sometimes the *diuresis* was promoted by swallowing garlic or mustard-seed. Although the *ascites* was accompanied with the hard swelling formerly mentioned *, nothing was further done, except fomenting the part, or covering it with a warm plaster. Some irregular and obstinate agues were removed by the same medicines ; or if they returned after the cure of the dropfy, they were then successfully treated with the Bark †.

The jaundice, without fever, was likewise cured by the lixivial salts, and the same purge ; and both in that distemper and in the dropfy I have observed good effects from antimonial vomits.

* Part iii. ch. iv. § 2.

† Since that time, I have given in cases of irregular agues, where I suspected obstructions of the *viscera*, the following mixture (little different from that mentioned above) for a continuance, and with good effects :

R. *Florum chamæmeli* ʒβ. *aquæ puræ bullientis* ʒviii. *macera per dimidium horæ et colaturæ admisce spiritus vini Gallici* ʒii. *salis absinthii* ʒi.
Dentur quater, quotidie, cochlearia iv.

C H A P. VI.

Observations on the camp-dysentery.

THE putrid or bilious disorders of the camp were divided into fevers and fluxes* ; having fully treated of the former, I now come to the latter, but shall confine myself to that *species* called the dysentery, as it is the least known out of the field, and is often general and fatal there. I shall first describe the disease ; then give an account of the dissections of some who died of it ; after which, I shall inquire into its cause ; and lastly, propose what I observed to be most successful in the cure.

§ 1.

A description of the camp-dysentery.

SOME dysenteries appear upon first taking the field ; but the cases are never so bad, nor nearly so frequent, as towards the end of summer, or in the beginning of autumn. At that time they become epidemic and contagious, prevail for about six weeks, or two months, and then cease. They are always most numerous and worst after hot and close summers, especially in fixed

* Part ii. ch. i.

camps, or when the men lie wet after a march in warm weather.

The sure diagnostics of the dysentery, besides some feverish symptoms, are a disorder at the stomach and wind in the bowels, small, but frequent stools of a slimy and frothy matter, a *tenesmus*, and gripes. Blood mixed with the *feces* is a common, but not a constant symptom; for, many have all the other marks without this, at least in the beginning, and others have blood in their stools from various causes without a dysentery: but as this disorder is mostly attended with blood, for that reason it has been called the *bloody-flux*.

Such are the pathognomonic symptoms, which are sufficient to distinguish this distemper from a *diarrhoea*, an hæmorrhoidal, and all other fluxes. Agreeably to this description, *Sydenham* and *Willis* use the term *dysentery*, and apply it to every case of that flux which raged at *London* in the year 1670; though *Sydenham* says, that some of his patients voided no blood*; and *Willis* observes, that his, for the most part, had none but watery stools†. The name is one of the few particulars in which those celebrated authors agree, in their account of that disease. And *Morgagni* mentioning that epidemic, takes notice of the propriety with which *Willis* applies the word *dysenteria*.

* *Morb. Acut. sect. iv. cap. iii.*

† *Pharm. Rat. sect. iii. cap. iii.*

to a flux with the symptoms above mentioned, though without blood, but would, for more distinctness, call it the *dysenteria incruenta* *.

It may be remarked, that in confining this appellation to such symptoms, I have deviated from the ancients; and therein may be the more blameable for having upon another occasion found fault with others for the like freedom†. But the case is not the same, since those authors had made an unnecessary change, by giving different names to two stages of the same disease, whilst here, the ancients having used a term, either in so lax an acceptation as to include several disorders of a different kind, or in so confined a sense as not to comprehend all the varieties of the same distemper, I was forced to leave them, and take the definition from those who were become better acquainted with the nature of this flux.

Thus, the word *dysentery*, in the original *Greek*, importing a disorder of the bowels in general, we find *Hippocrates* using it not only to signify all ulcerations, but all hæmorrhages of the intestines (even those which are critical and salutary) and likewise every kind of flux, with, or without blood‡. It would seem however, that after his time some

F f 2

of

* De Sed. et Caus. Morb. epist. xxxi. § 11. et 13.

† Part iii. ch. ii. § 6.

‡ Dysenteria est exulceratio intestinorum---alii verò, inter quos ipse HIPPOCRATES est, dysenteriam interdum appellant non ipsam modò exulcerationem intestino-

of the *Greeks*, whose works are lost, were sensible of this want of precision, and therefore confined the meaning of the term to an ulceration of the bowels attended with gripes and *tenesmus*, and with mucous and bloody stools. For, a disease with these symptoms *Celsus* calls *tormina*, and says, it is the *δυσεντερίη* of the *Greeks* *; and *Cælius Aurelianus* retaining the *Greek* name, describes the dysentery much in the same manner with *Celsus* †.

Yet *Galen* returns to the looser acceptation of the word, sometimes defining a dysentery *an ulceration of the bowels*; at other times mentioning four species of that distemper, all with bloody stools; but whereof we find one only agreeing with the *tormina* of *Celsus*, or the *dysentery* of the moderns ‡. I have consulted none of the other *Greeks* upon this article (supposing that they followed *Galen*) excepting *Aretæus*, who confining the term intirely to an ulceration of the bowels, accounts for all the symptoms, according to the particular gut affected and the circumstances of the fore, which if deep and corroding some

rum, verùm omnem etiam cruoris per intestina vacuationem: GORRAEUS in voce *δυσεντερίη*.

Ejus etiam dysenteriae quæ plerunque morbos plurimos salutariter, ac judicatoriè solvit, meminisse videtur HIPPOCRATES (Prorrh. 2.) *δυσεντερίην* etiam pro quovis alvi profluvio capere videtur HIPPOCRATES (lib. ii. Epidem.) FOESII *Oeconom. Hipp.* in voce *δυσεντερίη*.

* De Med. lib. iv. cap. xv.

† De Morb. Chron. lib. iv. cap. vi.

‡ De Caus. Sympt. lib. iii. --- De Loc. Affect. lib. ii.

large blood-vessel, he supposed might occasion a fatal hæmorrhage*.

From this it appears that the term *dysentery*, as used by *Hippocrates* and *Galen*, conveys no precise notion of a disease; and that unless those symptoms, which I have called pathognomonic, are always joined to an ulceration of the bowels (which is not always the case) the *dysentery* of *Celsus*, of *Areteus*, and of *Celius Aurelianus* must be accounted a different disorder from that which I am now treating of. Not but that the bowels are liable to be ulcerated in the true *dysentery*, but that ulceration is accidental and not essential to the disease. *Morgagni* in one place observes, that in this distemper the intestines are sometimes affected with ulcers, and sometimes not†; and, in another place, he takes notice of the ulceration happening only in its more advanced state‡. Further, from the dissections of that excellent anatomist, compared with those collected by *Bonetus*, and those made by Mr. *Cleghorn*§, and by myself, there will appear more instances of the soundness of the intestines, in this respect, than the contrary.

This opinion, concerning the constant ulceration of the bowels continued till *Sydenham* and *Willis* considered the *dysentery* as a disorder independent of any ulcer; and upon

* De Caus. et Sign. Diut. Morb. lib ii. cap. ix.

† De Sed. et Caus. Morb. ep. xxxi. § 12, 13.

‡ Somewhere in the same epistle.

§ Observ. on the Epidem. Diseases of Minorca, ch. v.

their

their authority, physicians seem to have relinquished their former system. And indeed *Sydenham's* account is upon the whole so just, that believing it unnecessary to enter upon a further enumeration of symptoms, I shall refer the reader to that well known author; confining myself to a few observations, to ascertain some points which he has left doubtful; and adding some others for rendering the history of the disease more complete.

Sydenham having little inquired into the nature of any *dysentery* excepting that which he himself describes, therefore questions whether there may not be as many kinds of that distemper as of the small-pox and other *epidemics*; which, according to him, so much vary, as in some particulars * to require a different treatment.

Sydenham seems to have been led into this opinion of the varying nature of epidemics, though appearing in the same form, from a belief that the wisdom of Nature was most manifested in its variety: "For (says he) we are not
 " to be surpris'd at these *lusus naturæ*, since it is universally
 " acknowledged that the deeper we penetrate into Na-
 " ture's works, the more we shall see of the vast diverfi-
 " ty, and the almost divine contrivance of her operations,

* ---cum fieri quidem possit, ut variæ enascantur dysenteriarum species, ut sunt variolarum, et epidemicorum aliorum, diversis constitutionibus propriæ, et quæ proinde medendi methodum in aliquibus diversam sibi suo jure vendicant. De Morb. Acut. sect. iv. cap. iii.

" which

“ which far surpasses our comprehension.”---“ So that who-
 “ ever has undertaken to comprehend all those matters,
 “ and to trace the multifarious operations of Nature,
 “ will find himself disappointed *.

But does Nature manifest its wisdom more by perplexing mankind, with varying distempers every season, or, by presenting them over and over, to teach us their nature and cure? In the first steps of our inquiry, we meet indeed with great variety and obscurity; but as we penetrate further into Nature, we find so much analogy amongst her works, that we are forced to acknowledge and revere her simplicity.

In the present case, I can affirm that all the epidemic *dysenteries* which I have seen in the army have been of the same nature; and I have been assured by Dr. *Huck*, and by other physicians employed, during the late war, not only in *Germany* but in *America*, that this distemper appeared with the same symptoms, and yielded to nearly the same medicines which were observed to be most successful in the military hospitals before. I may add, that both in *Scotland* and in this country, whenever I had an

* Neque est, cur hos Naturæ lusus hæc in re tantopere demiremur; cum in confesso apud omnes sit, quòd quò profundius in quæcunque Naturæ opera penetremus, eò luculentiùs adfulgeat ingens illa varietas, et divinum penè artificium operationum ejus, quæ captum nostrum longissimè superant. Adeò quisquis ille fuerit, qui in se receperit hæc omnia mente adsequi, et multifarias Naturæ operationes *κατα ποδας* indagare, partim magnis ausis excidet, &c. *ibid.*

oppor-

opportunity of treating such fluxes in my private practice, I never could see that they required any different method of cure. Nor do I find that *Degner* had reason to consider that flux which he describes, as a *species* different from others, and distinguishable by its contagious and bilious nature *. For, I have never known the dysentery epidemic, unless in summer, or in autumn, when the bile is most liable to be vitiated; nor have I seen any number ill of this distemper, without hearing several of them complain of sickness at the stomach and vomiting of gall. As to the violence of the symptoms mentioned by that author, I own it exceeds any thing that I have observed, upon the first seizure; but, when a number of men, even with the most favourable cases, have been crowded into the hospitals of the army, the dysentery has then appeared with all the virulence that it did at *Nimeguen*.

Sydenham observes: " That as all epidemics, at their first
 " appearance, seem to be of a more *spirituous* or *subtile* na-
 " ture than in their advanced state, so in the like manner
 " the dysentery proceeded; for the longer it continued,
 " it grew the more *humoural*. For instance, in the first au-
 " tumn, *several had no stools at all*; but with respect to the
 " severity of the gripings, the violence of the fever, sud-
 " den decay of strength, and other symptoms, it much
 " exceeded the dysenteries of the following years †."

* Hist. Medic. de Dysent. Bilioso-Contag. cap. i. § 1.

† Vid. loc. cit.

Here then we seem to have a *species* of the disease very unlike the common sort. But, besides that this remark was never, so far as I know, made by any one before *Sydenham*, nor has been confirmed by any author since his time, I must observe, that though we approved of his having considered the dysentery as a disorder in which there might, or might not be blood in the stools, yet we cannot justify him in calling that a dysentery, "in which there are no stools at all."

But if there is any mistake here, it is of little consequence, though I cannot say so much of that observation with which *Sydenham* concludes his subject. He says, "that though evacuations both by bleeding and purging were indispensable before *laudanum* could be administered, in those years in which the dysentery was epidemic, yet in any other constitution of the air, which has a less tendency to breed this disease, they may safely be omitted, and the cure completed by a shorter method, viz. by *laudanum* alone*." In this, I say, I must declare my dissent; for, though we cannot doubt, upon *Sydenham's* authority, that some slight cases of the dysentery have been cured in that manner, yet I have seen

* —quòd tametsi in his annis, quibus dysenteriae adeò epidemicè grassarentur, evacuationes priùs memoratæ prorsus necessariae erant, antequam ad usum laudani ventum fuisset, attamen in constitutione quavis huic morbo minùs faventi, istæ tutò omitti possunt, ac curatio compendiosiori viâ, solo nempe usu laudani, absolvi eoque quem diximus modo. Loc. cit.

such bad effects from this practice, both in the army and elsewhere, that I will venture to say, that no dysenteric case ought to be treated with *laudanum* before the *first passages* are thoroughly cleared.

The dysentery, as *Sydenham* observes, sometimes begins with a *rigor* succeeded by heat, but often with gripes without any feverish sensation. This last part is perhaps not strictly true; for, though the patient himself may not mention any feverish symptom, yet upon examination we shall find, that interchanges of heat and cold, lassitude, loss of appetite, and the like febrile affections have always been more or less the forerunners of the disease. Frequently, the beginning of a flux will have the appearance of a bilious fever; for the patient will have a fever, with a disorder in his stomach and bowels, for two or three days before the purging comes on; but after that, the feverish symptoms sensibly give way. At other times, upon fatigue and exposition to cold during the dysenteric season, the men will be more suddenly seized with the flux, but scarce ever without some degree of fever. The sensible diminution of the fever upon the appearance of the looseness, seems to justify that expression of *Sydenham*, when he calls the dysentery “the fever of the season turned in upon the bowels*.”

Besides this previous fever, the patient is liable to one of a low and more dangerous kind. For the most part I

* Loc. cit.

have observed this to be brought on by neglecting the disease in the beginning, or by having recourse to opiates, and other astringents before evacuations. Sometimes, though rarely, I have seen the same kind of fever accompany the flux from the beginning and end in death, without discovering any error committed either in the regimen or medicine. But the most fatal sort of fever which so often attends the dysentery of the army, though not essential to it, is the *hospital* or *jail-distemper*, which at all times infects foul and crowded places, but never so much as when they are filled with patients ill of so putrid a disease. This fever combined with the bloody-flux is commonly mortal.

The stools at first are generally copious and excrementitious, but the next day, or soon after, they become small, watery, and slimy, and are attended with teasing gripes and *tenesmus*. From this time till the favourable turn, natural *feces* are seldom seen, except when a purge operates briskly and carries them down; then indeed the patient is less griped, has fewer motions, and less *tenesmus*.

Besides the *mucus* in the stools, Sydenham ought to have mentioned a watery humour which is always mixed with the slime. This *serum* is perhaps one cause of the irritation, and descends from some higher parts of the intestines, whilst the *mucus* is mostly secreted from the *rectum* in straining.

Streaks of blood denote the opening of some small vessels at the end of the *rectum*, but a more intimate mixture is a sign that the blood comes from a higher source. This hæmorrhage which alarms most is the symptom least to be dreaded; for, though the oozing be constant, the quantity of blood lost, except in a few cases, is inconsiderable. *Morgagni* observes, that most of the blood may come from the intestines, without any rupture of the blood-vessels, and only by their greater dilatation; and this opinion is most agreeable to what I have seen in dissections.

Nor are we to be alarmed at the loss of so much of the ferous humour; for the amount of the whole is not nearly so great as in a common *diarrhoea*. Yet the frequency of the motions has given a false indication for the early use of astringents, whilst, in fact, the passage through the intestines is already so much obstructed, that to restore and preserve it, is the most essential as well as the most difficult part of the cure.

There are some other substances, omitted by *Sydenham*, which are less commonly seen in the stools, *viz.* round worms, balls of hardened excrements, and some smaller bodies of the colour and consistence of suet.

Worms we never considered as the cause of the flux, but as concurring with other causes to make it worse. It would seem that in this morbid state of the bowels, by
struggling

struggling to get out they increased the irritation. Sometimes I have known them make their way by the mouth.

The balls of hardened *feces* may come away at any time of the disease, but I have observed them mostly in its advanced state, and when I suspected that purging had been too long neglected. I have commonly seen the *tenesmus* and all other symptoms give way, after they were carried off by a brisk dose of physic. These *scybalæ* are of so firm a texture, and so round, that they seem to have been formed in the cells of the *colon*, and to have lain there from the beginning: for, we can scarce suppose them to have afterwards acquired that figure and consistence during a constant irritation of the intestines, and the low diet which patients then use.

As to the white substances, which I compared to fuet, I do not know whether they are the same which *Hippocrates* calls *σάρκες* (*carunculæ*) but they are plainly described by *Aretæus* and *Cælius Aurelianus*, and have since been taken notice of by later writers under the name of *corpora pingua*, and variously accounted for. Although I had frequently seen them, I had neglected to examine them till the autumn 1762, when Dr. *Huck* and I visiting a patient ill of a dysentery, who voided such substances, we preserved one of them which we viewed at leisure, and were both satisfied that the subject of our inquiry was nothing but a bit of cheese; though the patient assured us afterwards, that he had tasted none since the beginning of his illness,

illness, which had been of above a fortnight's standing. Now, whether this cheese had been collected from smaller particles which had passed from the stomach to the *colon* before he was taken ill, or had been since formed of milk which he had always used (and which might have curdled in his stomach) we could not determine: but we were both convinced that, in whatever manner this substance was produced, it must have been of the same nature with all those *corpora pingua* which we had so often seen in the dysentery.

With regard to the abrasions of the villous coat, and other substances said to have been observed in the stools, I can say nothing, having never seen them; though I do not call in question what has been so often mentioned by others*. The offensiveness, and even danger of such an inquiry, will serve as some excuse for not carrying it further.

The stools are all along distinguished by a certain smell different from that of common excrements; it is faint, and not rank at first, but towards the end, when the bowels begin to mortify, the *fætor* is cadaverous and intolerable. At such times they are probably most infectious. I

* Hæc sunt ramenta ξύσματα dicta HIPPOCRATI, quæ meritò damnavit.—Testatur GALENUS se multos vidisse et sæpe, quibus, cum morbis gravibus et diuturnis conflictatis, maxima intestinorum pars sic corrumpebatur, ut compluribus in locis tota interior tunica esset destructa, imprimis in morbis dysentericis. VAN SWIET. Comment. in Aphor. BOERH. § 721.

have observed elsewhere, that in a natural state the *factor stercoreus* is owing to a mixture of putrid matter with an acid, and that by this combination the *feces* acquire a particular, and a stronger smell than they would otherwise have, and are less apt to spread infection*. But in this distemper, it would seem as if the acid, which is generated in the stomach and smaller intestines, were hindered by the spasms from passing through the large intestines, and that the *feces* were thereby deprived of their proper corrector.

Among other symptoms omitted by Sydenham, is the flatulence, of which the most obvious source is from the aliment that in this disorder of the stomach ferments too strongly, and generates both this air and an acid, as appears from the Experiments subjoined to this work†. Another source may be from the blood and other humours which stagnate and putrefy in the larger intestines; for, it is well known that all animal and vegetable substances yield much air when resolved by putrefaction. Besides, the mass of blood having acquired a more than natural putrescency, by the absorption of corrupted matter from the intestines, may from that cause be more disposed to part with its air, and to throw it upon the *primæ viæ*. But however this may be, it is evident that the air, which abounds at this time in the *first passages*, occasions often a

* Appendix, Paper vii. exp. xliii.

† Paper v. and vi.

sense of oppression, or increases the gripes, according to the place where it is collected, whether in the stomach or in the smaller or greater intestines, and in proportion to the spasms which imprison it. I have known more than one case of a *tympanites* (or an immoderate distension of the *colon* by air) from the premature use of opiates and astringents in the dysentery. Early in the disease, the stools are of a frothy consistence like yeast; but this is only the natural state of the *mucus*, which is mixed with the air when it comes out of the glands. For, by M. de Haller's experiments, upon pricking the internal coat of the intestines of a living animal, this kind of frothy matter is expressed from the mouths of all the secretory vessels around the irritated part*.

It might be of use to know what gut is particularly affected when the gripes are most severe. But this cannot be well ascertained, considering how much the intestines may change their place by the peristaltic motion†, how their situation may vary in different persons, and how readily the pain of the *colon* may be confounded with that of the smaller guts which are surrounded by it. In general, the irritation of the stomach and higher intestines is attended with more sickness than gripes; and therefore when the gripes are most acute without sickness, it is probable that the spasm is in the lower guts. When the pain is about the middle of the belly, we may presume that

* Opera Minora, p. 394, & seq.

† Ibid. p. 301, & seq.

the spasm is in the smaller intestines ; but of this we cannot be certain, as in some subjects the upper flexure of the *colon* has been found as low as the umbilical region. Pains in the sides, back, and region of the kidneys, may be referred to the *colon* ; but if the pains are felt towards the *os sacrum*, we may then suspect that the upper part of the *rectum* is affected. For, the pain arising from the irritation of that gut may be referred equally to the back, and to the lower part of the belly, as a stone descending from the ureters is felt both ways, behind as well as before. But when the lower extremity of the *rectum* is irritated, the spasm seems not then to be so much productive of pain, as of a violent *nifus* drawing into *consent* the muscles of that part, as well as others which act in discharging the *fæces*.

The stools are always preceded by sharp gripings, and succeeded by some respite ; but the motions being so frequent, the patient can have no considerable ease, unless the spasms are removed by opiates, fomenting the belly, raising a sweat, or by evacuating the acrid and irritating matter with a purge. Indeed when the bowels begin to mortify, the patients, though restless, complain of little pain or *tenesmus* ; nay I have known them quite free from these last symptoms not only for some hours, but for some days before their end. At such times they have some degree of *delirium*, though I have known several who were sensible to the last.

It may be remarked, that *Sydenham* mentions nothing of the *tenesmus* till the patient is in a convalescent state, though that symptom is certainly one of the first which characterises the dysentery. But this is no omission of our author; for what others understand by a *tenesmus*, and what I meant by that term in treating of the pathognomonic symptoms, *Sydenham* expresses by *intestinorum depressio cum dolore*, and by *molestissimus viscerum omnium quasi descensus*. As to his observation, “of the intestines being affected successively
“downwards, till at last the disease is driven to the *rectum*,
“where it ends in a *tenesmus*,” strictly speaking it cannot be admitted. For, though the *rectum* is generally the last part that recovers, and the *colon* remains longer diseased than the small intestines, yet there is properly no such progression as *Sydenham* describes. From the beginning, the whole intestinal tube is affected at once, and the *tenesmus* is very early as violent as it is ever after in the course of the disease. The obstinacy of the *tenesmus* seems sometimes to be the cause of death; for, by the constant irritation, the *rectum* at last mortifies. In those bodies which I have opened, I found the gangrene in the intestines always worst the nearer it was to the extremity of the *rectum*.

Sydenham observes, that the *tenesmus* remaining at the end of the flux is not owing to an ulceration of the *rectum*: according to him, “in proportion as the bowels recover
“their tone, they depomite the remains of the morbidic
“matter

“ matter in this gut ; which being continually irritated
“ thereby, discharges at every stool part of the *mucus* with
“ which the intestines are naturally lined.” But does it
not seem more natural to ascribe this remaining *tenes-*
mus to the foreness of a part, which has been so much in-
flamed and excoriated in the course of the disease, and
which by its constant irritation is still kept from recover-
ing ? Add to this, the observation that has frequent-
ly been made, of the *tenesmus* giving way upon the pa-
tient’s voiding some hardened excrements (such as were
mentioned above) the chief cause of the irritation. That
the *tenesmus* which succeeds the dysentery may be sometimes
owing to an ulcer, is asserted by *Morgagni*, but who gives
only one instance of it in his practice.

Sydenham does not mention a *proidentia ani* nor a strangu-
ry, which I have known accompany bad cases of the
dysentery. The former symptom arises from the violent
straining ; and the latter, from the inflammation spread-
ing from the *rectum* to the neck of the bladder.

Nor does *Sydenham* take notice of any contagion that at-
tended his epidemic ; *Willis* expressly says, that the dysen-
tery described by him (which was the same with *Syden-*
ham’s) was not infectious. But all that can be inferred
from thence is, that either the dysentery, which they saw,
was of a milder nature than the distemper usually is
when it becomes general, or that this circumstance

escaped their notice. It is true indeed, that this disorder is not so catching as most others of the contagious kind; but whenever it has been epidemic, I always found it in some degree infectious; and especially in military hospitals, and in the houses of the poor, who want the means of cleanliness.

The duration and issue of the dysentery are uncertain; much depending upon medicine, good air, attendance, and the care which the patient takes of himself. If nothing is wanting, and the flux recent, it will be generally cured: but these favourable circumstances occur amongst the officers only. The case is different with the private men, who not only apply late for assistance, but are either exposed to colds in the field, or, which is worse, shut up in the foul air of an hospital.

It is the sign of a bad case when the first vomit and purge do not relieve; when the hectic fever increases; when the disorder of the stomach does not yield to evacuations; when the countenance alters much; when the pulse sinks and intermits; when the patient is restless, without complaining of gripes. In the beginning, a hiccup is little to be dreaded; but in the low and advanced state, if obstinate, it is commonly a sign of a mortification. The disease, when fatal, ends in a prostration of strength, a sore throat, or *aphthæ*, involuntary and cadaverous

verous stools. Sometimes, before the end, when the spasms give way by a putrid resolution, the aliment, as in a lientery, will pass through the intestines with little alteration.

In the most favourable event, those men who have been sent to an hospital can be of little service for the rest of the campaign; as no distemper is so apt to return upon any error in diet, or exposition to cold. Not that these returns are so much relapses into the true dysentery, as they are *diarrhoeas*, but with more of the dysenteric symptoms than are common in the white flux. For, though the original disorder takes a favourable turn, yet the disposition to a looseness continues; as the bowels are too tender to bear the natural *stimulus* of the bile, and of the other secretions without being irritated by them.

Such are the observations which I have been enabled to add to Sydenham's, from the frequent opportunities that I have had of seeing the distemper in all its forms.

§ 2.

Of the dissections.

HAVING described the dysentery, I shall next relate the changes which I have observed in the bodies of those who died of it, and were opened. This is a part of the history.

history of that distemper in which both *Sydenham* and *Degner* have been defective.

1. In autumn 1744, a soldier, who had been ill of the bloody-flux for about three weeks, was sent with some other sick from *Tournay* to the hospital at *Brussels*. His pulse was low, his strength wasted, the gripes and *tenesmus* were great and incessant, and his stools were no longer bloody but of an ichorous colour; a change which often happens from the corruption of the blood. On the third day after his arrival, the pains abated, his pulse sunk, his extremities grew cold, a slight *delirium* succeeded, and he died on the fourth.

I found the larger intestines black and putrid, the coats preternaturally thick (the sure mark of a preceding inflammation) and on the inside ulcerated; especially in the *rectum* and lower part of the *colon*, where the villous coat was either abraded, or changed into a corrupted slimy substance of a greenish colour. The *cæcum* and its *appendix* were less corrupted; and the smaller intestines and stomach were neither mortified, discoloured, nor abraded, but only distended with air. The fat of the *omentum* was greenish; but neither the liver nor spleen seemed to be tainted; only the bile was thick, ropy, and of a dark hue. The part of the *vena cava* which lay on the *vertebræ* of the loins was very tender. The lungs adhered a little to the left side, but were otherwise found. In the right ventricle

of the heart the blood was clotted, but in the larger vessels it was more fluid and of a blackish colour.

2. About the same time, a soldier of the artillery, after recovering of a *diarrhoea* was seized with a dysentery, upon having drunk immoderately of some cold liquor whilst he was hot on a march. Three days afterwards, he was brought into the hospital; and besides the common symptoms, he complained of the piles and the gravel. This man could not lie down, but supported himself on his knees and hands, leaning his head forward upon the bolster till his death; which happened three or four days after his admission.

Upon opening the *abdomen*, I observed that the greatest part of the *omentum* was in the left side under the small intestines, but that it was large and full of fat. The liver was small and found; but the gall-bladder was of an uncommon size, and full of a dark coloured bile, thin, though somewhat curdled. The biliary ducts were clear. The *pancreas* was in a natural state. The spleen, though of a common shape, was of an extraordinary bulk, being little less than the liver, and weighed three pounds eleven ounces; but it seemed otherwise found, without indentations, having only upon the side next to the blood-vessels a small protuberance like the *portæ* of the liver. The kidneys were small and flaccid, and the *pelvis* of both, especially that of the left side, was larger than common; and both these and the bladder (which was in a corrupted state)

state) contained some urine, but neither stone nor gravel. The *rectum* was most putrid; and from thence the gangrene seemed to have spread itself to the *colon*, which was plainly mortified, and chiefly at its lower end. The villous coat was partly consumed, and what remained was blackish, tender, and easily to be separated. The vascular coat had the appearance of a preparation well injected with red wax. The ligaments, which contract the *colon* and form the cells, were half corrupted, and adhered loosely to the outer coat. Part of the *cacum* was also mortified; the rest, as well as the smaller intestines, were of a firmer texture, but of an inflamed colour; and both these and the stomach were full of air. It was remarkable, that notwithstanding this diseased state of the bowels, no part of them was ulcerated. The cavity of the *thorax* seemed to be uncommonly small; for the convex part of the diaphragm reached as high as the insertion of the third rib into the *sternum*: the lungs were nevertheless found. The heart was large, and contained in its right ventricle some coagulated blood of a coriaceous firmness, which did not adhere to the sides, but was entangled with the tendinous fibres of the *valvula semilunares*. Both the sinuses were full of blood, partly congealed, partly fluid, and of a blackish colour.

3. In the same season, a foot-soldier was sent into the hospital, supposed to be ill of a dropfy. His belly was
much

tified or inflamed. The liver was of an extraordinary bulk, reaching almost to the navel and spleen, and weighing about ten pounds. Its substance was tender, and in the posterior part of it, next to the diaphragm, was found a large abscess. The gall-bladder was of a moderate size, and full of a thin dark-coloured bile. The lungs were found. We found little or no water in the *thorax*; but more than usual in the *pericardium*. The heart was small, without any clot, and indeed with scarce a drop of blood in the ventricles.

4. Some time later in the season, a soldier was received into the hospital, about the twentieth day of a hectic fever succeeding a dysentery. His pulse was then low, his tongue parched, his cheeks florid, though his body was wasted. He complained of great debility, of pain in his bowels, of a looseness, and of retchings to vomit. In a few days after, he was seized with a hiccup, and died.

Although the body was opened the next day, the smell was intolerable. The intestines were wholly mortified, and the stomach partly so. The outward coat of the liver was also putrid; and in its substance were several abscesses containing a purulent, or ichorous matter. The spleen was likewise corrupted; but the kidneys, heart and lungs appeared to be found.

These dissections were made during the former war; and no opportunity of a further inquiry offered till three years

years ago *, when after an unusually warm and dry summer the dysentery was frequent in *London*.

5. A young woman, of 17 years of age, was taken ill in the beginning of October with the malignant symptoms of this disorder. Her pulse sunk, and her strength failed early in the disease; the stools were incessant, slimy, watery, and bloody; and whenever she was free from gripes she complained of sickness: nothing gave her relief, and she died on the 11th day. About a fortnight after, the father, who had been much affected, and indisposed since the death of his daughter, was seized with the same distemper. This person was in his 46th year, of a full habit, and had lived freely. Till within three or four years of this illness, he had been subject to frequent returns of a fever; but from the time that a tetter broke out on several parts of his body, he had been free from every complaint, excepting the crusts and blotches occasioned by that eruption. The dysentery began with sickness and heat at his stomach, with gripes, *tenesmus* and a looseness. In a day or two, the stools were incessant, slimy and bloody. I was called early in the disease, and believing that evacuations had not been timely enough made in the daughter's case, I began by taking away a large quantity of blood; but as the patient was not thereby relieved, as the blood was not fizy, and as his pulse was never hard nor full, the bleeding was not repeated.

* Viz. in autumn 1762.

I shall not enter into further particulars, but observe, that though various medicines were tried, such as evacuants, antiseptics, demulcents, and anodynes, none of them were of any sensible benefit, excepting a decoction of *Serpentaria* with *theriaca*, which was given him when his pulse began to sink and intermit. He died on the 20th day after I was called; but, for some days before his death, I observed his countenance alter, and the hectic fever increase; and though his gripes and *tenesmus* had ceased, yet the motions were more frequent than ever, and more watery and bloody. From the first, he was feverish, restless, and complained of a sickness at his stomach, which was augmented by every thing he ate or drank; towards the end he was troubled with a hiccup, he could retain no clysters, and his stools were extremely offensive. He was sometimes slightly delirious; but it was uncertain whether that might proceed from his fever, or the opiates. On the day after his death, the body was opened by Mr. Hewson surgeon and anatomist; Dr. Huck and I being present.

Upon cutting into the *abdomen*, we found the *tunica adiposa* of a considerable thickness, notwithstanding the long continuance of the disease. The stomach and smaller intestines were inflated, but otherwise in a natural state, excepting at the extremity of the *ileum* where it joins the *cæcum*; for at that part the coats of the gut were thicker and more tender than they ought to have been; and on the

the inside we found that glossy colour which has been considered as a mark of inflammation.

But the larger intestines, from the *cæcum* to the end of the *rectum*, were not distended, and the *rectum* was even more contracted than in a natural state. Their colour, externally, was of a purple black; and this gangrenous appearance increased gradually from the *cæcum* to the extremity of the *rectum*. Upon cutting them open, we found the coats thickened, the inside as black as the under part of the *coagulum* of blood, and the whole surface more or less covered with a dark coloured bloody slime. In the *rectum* these morbid appearances were worst. The blood did not seem to have come from any ruptured vessel (for it was collected no where in any quantity) but to have gradually oozed through a number of fine pores into the cavity of the intestines. The smell of these parts was exceedingly offensive.

At first sight the villous coat seemed to have been resolved into the slime above mentioned; yet upon a nearer inspection we thought it more probable, that in both the *cæcum* and *colon* the villous coat, though diseased, was not separated, whatever it might be in the *rectum* which was too putrid to be minutely examined.

The Dissector having cleared away the blood and *mucus* from the inside of the *cæcum*, and of the *colon* and upper part of the

the *rectum*, made us take notice of certain protuberances of a lighter colour than the rest of the surface. They were of a roundish figure, nearly equal in their height (which was about a twelfth part of an inch) but of unequal breadth. We all agreed that we had never seen any thing so nearly resemble the small-pox, of a flat sort at the height of the disease. These excrescences stood as thick on this tract of the intestines, as variolous pustules, when numerous, do upon the skin; but differed from them in this, that as far as we examined them they were of a firm consistence without any cavity. Mr. Hewson told us, that he believed they took their rise from the cellular membrane which lies immediately above the villous coat; for that some days before, having opened another person, who had likewise died of the dysentery, he had found the appearances much the same as in this subject, and particularly with regard to these tubercles, which he had examined at more leisure. He added, that he had preserved a part of the *colon* in spirits, which he would shew us at another time. These protuberances were only in the larger intestines; for though we likewise opened the smaller, we could observe nothing similar to them there.

In the whole intestinal tube we found neither worms, *scybala*, nor any formed feculent matter; though the nurse told us, that on the day before his death he had voided some hard substances of a roundish shape.

The

The mesentery was loaded with fat of a natural colour and consistence ; as was also the *mesocolon*, even to the process belonging to the *rectum*, which of all the intestines was observed to be the most putrid.

The urinary bladder was quite contracted ; that part which lay next the cavity of the abdomen was found, the other was not examined. I ought to have observed, that the patient could retain his urine to the last, though in the beginning of the disease he had complained of a strangury. The kidneys were not inspected.

The liver was in a sound state, not only as to outward appearance, but in its substance. The gall-bladder was empty of bile, and contained only a little air. The spleen was without any apparent fault. But the *pancreas* was of a small size, and somewhat hard ; yet it was not *scirrhus* ; and Mr. *Hewson* even doubted whether in any degree it could be called morbid. As the cartilages of the ribs were intirely ossified, the *thorax* could not be opened but by a saw, with which we happened not to be provided : but we cut through the diaphragm, and observed that the lungs were sound. No water had been collected either in this cavity or in the *abdomen* ; nor were there any ulcers or purulent matter to be seen in either.

Some time afterwards, Mr. *Hewson* shewed me that portion of the *colon* which he had cut out of the other body,
and

and had preserved in spirits : he said, that to the best of his remembrance he had taken it from the lower part of the gut. I could easily trace the resemblance between this preparation and that which I had seen in the recent subject ; though the tubercles were here more numerous, and generally higher than in the other. Dr. *Hunter*, who was present, did not recollect to have seen that kind of morbid appearance before, but was satisfied that the villous coat had not been separated, though here and there some partial abrasions might have been seen on dissection.

These are the only dissections which I have seen of those who have died of the dysentery. Although there was some variety in every case, yet they all agreed in the bad state of the larger intestines. The colour and smell were proofs of the putrefaction of the blood in those parts ; and the tenderness of the coats shewed that they were in some degree mortified. In an external gangrene, we commonly observe some vesicles of air in the cellular membrane, which being wanting here, it may be disputed whether the mortification of the bowels was complete without that circumstance.

The tubercles, which were found in the large intestines of the last body, might have been considered as a singularity, if the Dissector had not taken notice of the same appearance in that body which he had opened before ; for
I can

I can well suppose that they might have been seen in the other subjects, if I had more narrowly inspected them; and I am the more inclined to this opinion, from finding in two authors some remarks to the same purpose. Thus *Linneus*, in treating of the bloody-flux, says, *dysenteria epidemica scabies est intestinorum interna, ut ex dissectionibus cadaverum dysenteria defunctorum patet* *. Upon what grounds that learned author uses the term *scabies*, he does not inform us; but from his using it, I would infer that he had either seen some such appearances, or had an account of them from others upon whose testimony he could rely. And Mr. *Cleghorn*, who had frequent opportunities, at *Minorca*, of seeing the epidemic dysentery, observes, “ that upon opening the bodies, he constantly found the great guts “ either intirely mortified, or partly inflamed, partly mortified; that the *rectum* was mostly affected; and that in “ many he had seen *scirrhus tubercles* straitening the cavity “ of the *colon* in several places †.” Now, though those tubercles, which I described in my patient, were too flat to be taken notice of, as straitening the cavity, yet in Mr. *Hewson’s* preparation they were perhaps protuberant enough to have had that effect.

On the other hand it may be remarked, that such protuberances are scarce mentioned in the *Sepulchretum* of *Banetus* ‡,

* *Amoenit. Academ. vol. v. dissert. LXXXII. p. 97.*

† *Observations on the Epidemic Diseases of Minorca.*

‡ *Quer. whether in lib. iii. sect. xi. additam. observ. 5?*

or in *Morgagni's* valuable supplement. But the silence about them in those two works is perhaps no proof against their frequently existing, when we consider that in *Bonetus* we have but a few cases (and those but imperfectly delivered) of those who died of an epidemic flux; and in *Morgagni*, of that sort none at all. For, though that excellent anatomist has, in his usual manner, made some useful remarks upon the disease, and has added a few dissections of his own *, yet since his cases seem to be all of the sporadic kind, I must consider them as somewhat different from such as we are now treating of. Indeed *Morgagni* acquaints us, that he had generally declined opening the bodies of those who died of any infectious distemper †.

In the former dissections, I mention *the abrasion of the villous coat*, and perhaps in my account of the last I should have made the same observation, had not Mr. *Hewson* been inclined to think otherwise; and had not Dr. *Hunter*, in viewing the preparation (which was mentioned before) been of opinion, that in that portion of the gut the villous coat had not been separated, though perhaps fissured, and a little abraded on the top of some of the tubercles; and that, from the account which Mr. *Hewson* and I had given him of the last subject, there had been no considerable abrasion in those intestines, more than in that piece which was before him.

* De Sed. et Caus. Morb. ep. xxxi.

† Ibid. ep. XLIX. § 32.

§ 3.

Of the causes of the dysentery.

THE heat and moisture of the air appear to be no less the chief *remote* and *external cause* of the dysentery, than of the autumnal remitting and intermitting fevers*; and therefore when other circumstances are equal, it generally prevails in the camp towards the end of summer, or in autumn, after great and continued heats †, which, as was shewn above, are always attended with a loaded atmosphere. Upon comparing the account which I have given of the flux that occurred in every campaign, with the description of the same distemper by other authors, we shall find this principle sufficiently verified. *Sydenham* indeed, in the history of the epidemic dysentery of his time, takes no notice of the weather, going upon a false principle, that the morbid constitution of the season has never any connexion with the sensible qualities of the air. But *Willis* supplies this defect, and observes that the summer of 1670 (which preceded the autumn wherein that flux was at its greatest height) was remarkably hot ‡. In the year 1762, the summer heats and drought were of a longer continuance than I remember to have observed them in this country; and accordingly in autumn, the dysen-

* See part iii. chap. iv. § 3.

† See part i. chap. iii. and vii. part ii. chap. ii. § i.

‡ Post æstatem impensè calidam et siccam. *WILLIS* Pharmac. Rat. sect. iii. cap. iii.

tery was so frequent in *London*, that though it could not be properly called epidemic, yet I believe more cases occurred in that season, than in all the sixteen years that I have resided here. Yet I do not advance this as a rule that will hold universally; for that epidemic which raged at *Nimeguen* in autumn 1736 came after a summer that was indeed warm, but to no extraordinary degree; and then none of the neighbouring towns suffered, unless by their communication with the place infected. When the question is about a *remote cause*, it is always understood, that however prevalent it may be, it is not sufficient for producing an effect, without a concurrence of the more *immediate causes*; and that when the *immediate causes* are strong, they will produce the effect, independently of *remoter causes*.

Corresponding to the *remote external*, is the *internal predisposing cause*, namely a more than ordinary putrescent state of the blood, from a constant exposition to the sun in the hottest weather. We may likewise observe, that our men dealing little in vegetables, and not being able to afford the price of fermented liquors, were in such circumstances deprived of two considerable antiseptics. For, in general it may be remarked, that this disease *ceteris paribus* prevails mostly among such as are of a scorbutic (that is a putrid) habit, or among the poorer people, who from foul air, bad diet, and nastiness are most liable to putrid diseases. And there is an old observation, that such seasons as produce most flies, caterpillars, and other insects (whose increase

increase depends so much on heat and moisture, and consequently on corruption) have likewise been most productive of the dysentery.

Hitherto we have seen how similar the causes are of the remitting and intermitting fevers, and of the bloody-flux. Nay, the affinity extends even to the *occasional* or *exciting causes*. For, in the end of summer, or in autumn, when any number of men are exposed to night damps and fogs, especially after a hot day, or lie upon wet ground, or in wet clothes, part of them will be seized with that kind of fever, and part with this flux; and perhaps a third sort will have a disorder compounded of both. Add to this, that those fevers begin to be frequent in camp whilst the dysentery still subsists; that the first symptoms are often similar, such as the rigors, and disorder of the stomach; that the remitting and intermitting fevers of a more malignant kind have sometimes ended in a bloody flux*; that such countries as are most subject to these autumnal fevers, are likewise most liable to the dysentery; and that the analogy continues even as to the method of cure, in so far as the principal part of it consists in clearing the *primæ viæ*. Upon the whole, the nature of the two distempers appears so much alike, that at first sight Sydenham seems to have expressed himself justly, when he called this flux, “the fever of the season turned upon the bowels.” But

* TH. BARTHOL. Hist. Anatom. cent. ii. hist. LVI.

upon

upon a nearer view we shall find this notion more acute than solid, since the circumstance of its being contagious shews that the dysentery is a good deal different from these fevers. *Degner* offers good reasons for believing that the fatal dysentery at *Nimeguen* was owing to the infection communicated by one person*; and if the strangers suffered so little, and in particular the Jews †, we must ascribe that to the little intercourse which they had with the people of the place.

In camp, the contagion passes from one, who is ill, to his companions in the same tent, and from thence perhaps to the next.

The foul straw becomes infectious. But the great source of infection seems to be the privies, after they have received the dysenteric excrements from those who first fall ill. The hospitals likewise spread it; for, those who are admitted with the flux not only give it to the rest of the patients, but to the nurses and other attendants on the sick.

In general, the contagion is not suddenly diffused. For, whole towns and camps are never seized at once by the impurity of the atmosphere; but the infection is carried from one to another by the *effluvia*, or clothes, or bedding, &c. of the tainted person, as is the case of the

* *Hist. Dysent. Bilioso-Contag.* cap. ii. sect. XLVI. et seq.

† *Ibid.* cap. i. sect. XXXV.

plague, small-pox and measles. But the dysenteric *miasma* is of a less catching nature than any of these; so that in the milder epidemics it may pass unnoticed, as in that described by *Sydenham* and *Willis*, as was observed before*.

But of what nature is this infection? In the former editions of this work, I considered the spreading of the distemper as owing to putrid exhalations from the humours of those who fall first ill of it; and when this *miasma* is received into the blood, I conceived it to act upon the whole mass as a ferment, disposing it to putrefaction. But I am now sensible that this *hypothesis* would be insufficient, without likewise supposing that when the blood becomes tainted, the vitiated part of it, by some law in the animal oeconomy, is thrown particularly upon the intestines, for excretion. This notion of a putrid ferment was further confirmed to me by a case, which occurred, of one who was seized, indeed in a slight degree, with a true dysentery accompanied with bloody stools, after having made experiments upon human blood, which had become putrid by standing for some months in a close phial. This instance seemed to be the more decisive, as it happened at a time when the distemper was not heard of, and to a person in perfect health, who had formerly attended many dysenteric patients without being infected.

For these reasons I was inclined to refer the *causa proxima* or *immediate cause* of the disease to this putrid ferment: but having since perused a curious dissertation published by *Linneus*, in favour of *Kircher's* system of contagion by *animalcula*, I think it reasonable to suspend all *hypotheses* till that matter is further inquired into *.

In

* *Amoenit. Academ. vol. v. dissert. LXXXII.* This dissertation, which is intitled *Exanthemata Viva*, is, as well as all the rest of that work, in the form of an academical *Thesis* proposed by a student; but the whole having been published by LINNÆUS, is considered as his own doctrine. I shall transcribe what the ingenious author says upon the dysenteric contagion, as the book may not be in the hands of all my readers.

‘ Hanc (scil. dysenteriam) per secessus et cloacas communes propagari, ne ul-
 ‘ lus quidem medicinæ peritus ambigit. Medicum Danum, priori seculo *Helsing-*
 ‘ *burgi*, dysenteriâ sæpius correptum, excreta sua alvina observasse vivis referta, vix
 ‘ observabili motu se agitantibus, insectis BARTHOLINUS narrat. Quo loco non
 ‘ nobis est prætereunda observatio rem maximè illustrans. Quatuor adhinc annis
 ‘ Dom. ROLANDER, in ædibus N. D. Præsidis enutritus, dysenteriâ infestabatur;
 ‘ rhabarbarinis & paregoricis, more recepto curabatur. Octiduo abhinc in eundem
 ‘ incidit morbum, similiterque sanatur; octo verò aliis diebus præteritis dysenteriâ
 ‘ tertium corripitur: in causam omni studio inquiritur, non verò invenitur, quum
 ‘ æger eadem mensâ, vitæque genere cum cohabitantibus sanis frueretur. Itaque
 ‘ N. D. Præses ægro, Entomologiæ præcipuè studioso, excreta suadet scrutari, quo
 ‘ certius adpareret, utrùm allata BARTHOLINI observatio obtineret, nec ne. Hoc
 ‘ facto, in hisce myriades animalculorum se vidisse, quæque accuratè descripta, esse
 ‘ acaros, & acaris quidem farinæ similes, æger dixit. Causam verò non nemo in
 ‘ potum nocturnum conjiciebat: sed neque hæc aliis videbatur sufficiens. Inter e-
 ‘ dendum bibere insuetus erat: noctu igitur siti pressus e poculo, ex ligno juniperi-
 ‘ no confecto, potum sæpe hauriebat tenuissimum. Vas hocce introspeciens, lineo-
 ‘ lan quasi albicantem, oculis nudis vix conspicuam, inter costarum rimas reperie-
 ‘ bat; armatis verò observavit, omne hoc albidum non aliud esse quàm innumeros
 ‘ acaros, et ejusdem quidem speciei cum illis quos in excretis observaverat. Potu in

vas

In accounting for the dysentery, it may be remarked, that I have not attributed the disease either to fruit, or to the bile; though most authors in treating of it have accused one or other, and sometimes both. *Sydenham* indeed should be excepted. As to fruit, having in other parts of this work offered several reasons for believing that it has no share in producing this flux*, or indeed any of the military diseases, I need not repeat them here. But with regard to the gall, as I have called the dysentery one of the bilious disorders, some reason may be expected for my taking no notice of that humour upon this occasion. It may be remembered, that I have always used the term *bilious*, more in compliance with the ancients, to distinguish a certain class of diseases, than from an opinion that they are really occasioned by the bile. In this light I consider the autumnal remitting and intermitting fevers,

‘ vas infuso, non mutabantur; eos verò relictis sedibus, mediâ nocte, potûs superfi-
 ‘ ciem petere, ubi ad horam usque decimam a. m. pastum quærebant, dum priora
 ‘ loca repetebant, crebrâ tandem investigatione invenit. Exemptis acaris orbiculo
 ‘ humectato impositis, quàm parum, variis adfufis liquoribus, irritarentur, et quòd
 ‘ per oleum ipsum salvi transirent, animadvertit. A spiritu vini lædebantur, max-
 ‘ imè verò a tincturâ rhabarbari, quod imprimis notatu dignum; quum autem rha-
 ‘ barbarum dysenterix sit specificum, lapathumque acutum ei valde cognatum, &
 ‘ quotidiana scabiei medicina, affinitatem invenimus & analogiam. Vasi, ter licet
 ‘ aquâ calidâ abluto, adherebant. Illos in aliis etiam locis quærebat, inque vasis
 ‘ potûs acidi, & sub doliorum obturamentis sæpius reperiēbat. Dysenteria, quæ
 ‘ *Scaniæ* territorium *Gyinge* quotannis ferè, tempore messis, vexat, æquè ac ea, quæ
 ‘ in castris est vulgaris, ex iisdem acaris, in potu acido latentibus, qui inde per secef-
 ‘ sus propagantur, & contagium generant, originem suam fortassis traxerit. &c.”

* Part i. ch. iii. Part ii. ch. ii. § 4.

which I often call *bilious*. And as to the dysentery, I shall observe, that though at first, from the sickness at the stomach and vomiting, the gall may seem to be concerned, yet in the advanced state of the disease it must be wholly acquitted; since upon dissection, the liver and smaller intestines are generally found in a natural state, though these parts ought to be most liable to be affected by disorders of the bile. And as to the bile itself, we see it sometimes in a large, sometimes in a small quantity, sometimes of one colour, sometimes of another, sometimes thick, sometimes thin, and at other times of a natural consistence. Now had it any share in bringing on or supporting this disease, should we not find a greater uniformity in its appearance? Nay, I have even imagined, that such medicines as could procure a more copious secretion of the bile would often prove useful, having generally observed the patient most relieved, whenever an evacuant acted in such a manner as to carry down with it much of that humour.

§ 4.

Of the cure of the dysentery.

THERE are few acute distempers less beholden to nature for a cure, or attended with more deceitful indications. The hæmorrhage seems to require repeated bleedings; the flux, strong astringents; the pain of the bowels, constant opiates; and yet unless these remedies
are

are used with caution, they tend more to confirm than to remove the disease. On the other hand, emetics and purges have been either wholly condemned, or too sparingly used; yet later experience shews them to be the chief means of the cure. But setting aside for the present all indications (which, from our imperfect knowledge of the animal oeconomy, we are seldom enabled to form) I shall proceed to offer the result of my experience, and add some observations from others whom I can most rely on, and who have likewise been much conversant with the dysentery. With these further lights the nature of the disorder being more clearly seen, the reader may perhaps be directed to some more simple and certain method of cure.

In order to proceed with more clearness, I shall distinguish the dysentery into three *states*: viz. the first, whilst it is recent, or whilst the sick can easily bear evacuations; the second, when the distemper is of a malignant kind, or has continued long, and has much impaired the strength, inflamed the intestines, and brought on a hectic fever; and the third state, when the patient, though recovering, is kept low by a *tenesmus*, or some other remains of the disease, or is subject to frequent returns of a looseness, from the weakness of his bowels.

I. IN the *first state*, I begin with a moderate bleeding; though it may be true that a dysentery of itself does

not require that evacuation *: but as this disorder is partly of the inflammatory kind, and is often accompanied with a fulness of blood, bleeding is sometimes indispenfible, and indeed is generally conducive to the cure. Yet unless the fever be kept up by some inflammation not peculiar to the difeafe (as it frequently happens in the winter and vernal cafes) repeated bleedings are either unneceffary or hurtful, as may be obferved in moft diftempers arifing from a putrid caufe. In weakly habits, and where there are few feverifh fymptoms, I wholly omit this evacuation.

In the evening of the fame day I give an emetic. In the beginning of my practice in the army I ufed the *vitrum ceratum antimonii*, which I had formerly obferved to be the beft medicine in this cafe for relieving both the ftomach and the bowels. But as the virtues of that antimonical preparation have been fully fet forth elfewhere †, I fhall fay nothing of them here, and only obferve, that though I was convinced of its being a powerful remedy (by feeing it often fucceed when other things had failed) yet the roughnefs of its operation, and the prejudice conceived againft the *glafs of antimony*, as a medicine, having deterred the other phyficians of the army, and the regimental furgeons from ufing it, I alfo defifted, being defirous of afcertaining the efficacy of fome method that might be lefs

* Dyfenteria quâ dyfenteria venæfectionem nunquam indicat. BARBETTE Prax. lib. iv. cap. v.

† Med. Effays, vol. v. Mem. de l'Acad. des Sc. A. 1745.

exceptionable. Instead therefore of this preparation, I ordered a scruple of ipecacuanha; and for the common men, I generally added one grain or two of emetic tartar. Whether I gave the weaker or the stronger vomit, I observed it to be most successful when it likewise operated by stool. This effect was the more certain, when instead of the usual quantity of ipecacuanha, five grains only were given at once, and repeated at an hour's distance, twice or thrice, till a purging was brought on, which usually happened soon after the third dose. Fifteen grains exhibited in this manner were commonly sufficient. *Piso*, who first described this root, and recommended it in the dysentery, appears to have relied chiefly on its purgative quality, though he adds, that it still had a better effect when it vomited also*. When the stomach

* Perhaps the medicine is more cathartic while fresh than after long keeping; and better in decoction, or infusion, than in substance. We may observe, that *Piso* recommends the second and third decoction for weak patients, as less cathartic and more astringent. The following is one of his principal passages relating to the use of this specific. ‘Dehinc ad radicem *ipecacuanhæ* tanquam ad sacram anchoram
‘confugiendum, quâ nullum præstantius aut tutius, cum in hoc, tum in plerisque
‘aliis, cum, vel sine sanguine, fluxibus compescendis, natura excogitavit remedium.
‘Quippe præterquàm quòd tutò & efficaciter tenacissimos quosque humores per ip-
‘sam alvum, sæpiissime autem per vomitum ejiciat, & a parte affectâ derivet, vim
‘quoque astrictivam post se relinquit.... Illud vero hoc modo perficitur. Drachmæ
‘duæ radicis *ipecacuanhæ* in 3iv. liquoris appropriati coctæ, vel per noctem macera-
‘tæ, cujus infusum cum, vel sine oxymellis 3j exhibetur. Postridie semel atque
‘iterum, pro re natâ, secunda imò tertia ejus decoctio repetenda; tam quòd ægri de-
‘biliore eam facilius ferant, quàm quòd astrictoria ejus vis tunc magis efficax appa-
‘reat.” GUL. PISON. Hist. Nat. et Med. Indiæ Occident. lib. ii. cap. ix.

is chiefly affected, I give the ipecacuanha, either by itself, or with the tartar emetic, in the dose above mentioned; but when the person complains more of gripes than sickness, I direct the root to be divided as above, with a view to its more certain operation upon the bowels. In one or other of these forms, I give the emetic on the first day of my seeing the patient, whether he has been bled or not. If the full quantity be given, the operation is assisted, in the common way, with repeated draughts of camomile tea. But if the small doses be used, he ought to drink nothing till the medicine works downwards, and then he may take some water-gruel to promote its effect.

When the stools are large and bilious, and the patient fatigued with the operation, I give no medicine on the following day; but if he has taken the emetic all at once, so as only to clear his stomach, or if the divided doses have wrought weakly by stool, I order a purge next morning, *viz.* five grains of calomel, with five and twenty or thirty of rhubarb, which in ordinary constitutions is a moderate, or rather a small dose. At first I gave the rhubarb without any calomel, and my usual dose was half a drachm, but afterwards I found it necessary either to double that quantity, or to join calomel with a smaller dose, in order to procure a thorough passage. I have remarked in the former editions of this work, that “ we are
“ to attend less to the dose than to the effects, which are not
“ to be judged of by the frequency, but by the copious-
“ nefs

“nefs of the stools, and the relief which the patient finds
“from the gripes and *tenesmus* after the operation; and
“that as on the one hand the phyfician ought to avoid
“all the rough and ftimulating purges, fo on the other
“he is not to fpare thofe of a lenient kind, efpecially
“rhubarb, which is commonly under-dofed.” This is
ftill my opinion, except that with regard to rhubarb, I
never found it in this diforder have fo good an effect as
when combined with well prepared calomel, by which
means it becomes more lenient, that is, eafier in its ope-
ration.

At night, after the purge, I ufually give for the firft
time an opiate, *viz.* ten grains of the *pilulæ faponaceæ*, with
two, or fometimes with three grains of ipecacuanha,
either in a bolus or in a draught: for ever fince I found
that fome common soap-pills had paffed undiffolved, I
have difufed that form in all weakneffes of the intefines.
Formerly, I joined to the opiate a fmall quantity of the *vi-
trum ceratum antimonii*, in order to promote perfpiration;
but when I dropped that medicine as an emetic, for the
reafoons already given, I omitted it here alfo, and fupplied
its place with the *Indian* root.

Here I muft obferve with regard to opiates in the dy-
fentery, that it were better perhaps that they were never
given at all, than ufed before the firft paffages are cleared.
For, though from the beginning they are fure to give fome
imme-

immediate relief, yet by confining the wind and the corrupted humours, they tend to fix the cause, and to render the distemper more obstinate in the end. This is the result of my experience, which I am sorry to find does not exactly correspond with that of *Sydenham*. For, though that excellent physician did not omit purging when the dysentery was most epidemic, yet at all other times it appears that he trusted to laudanum alone. Now, whatever was the nature of those fluxes which he treated in that manner, I am almost certain that such as are most incident to an army are of a less tractable nature, and in general are not to be cured without repeated evacuations. As to the best kind of opiate, I have made no particular observation; and therefore if I have here specified the *pilule saponaceæ*, it was only because I preferred that composition to the simple *extractum Thebaïcum*, as there was less hazard of an error in the weight. It is well known that ten grains of these pills are equal to one of pure opium.

If the first two days have been employed in the manner described, I order no medicine on the third, unless the patient still complains of gripes; in which case the opiate is repeated at night. But, on the fourth day, if any bad symptoms remain, I direct the ipecacuanha to be given once more in divided doses; or if the patient should express great aversion to a drug which made him sick before,

before, I repeat the purge, and that in a larger dose if the former has not operated sufficiently. The largest of this kind, which in such cases I have used, consisted of thirty grains of rhubarb with eight of calomel.

By this time most of the dysenteric cases give way, and sometimes sooner. But if some *fomes* of the distemper still remains, or if the patient has committed any error in diet, or has exposed himself to cold so as to relapse, I have recourse to the same remedies, that is, either to the purge, or to the ipecacuanha, according as the one or the other has agreed with him before. In fine, these evacuants are the chief medicines which I trust to in this stage of the disease.

This method was nearly followed in the last war by the other physicians of the army, and in particular by Dr. *Huck*, who having been in constant service either in *N. America*, or in the *W. Indies*, had the best opportunities of seeing the dysentery in all its varieties. He informed me, that notwithstanding the difference of climates, the distemper, when epidemic in the army, appeared with much the same symptoms every where, and when cureable yielded to the same medicines. Believing it would be acceptable to the reader, I have subjoined a short account of Dr. *Huck's* practice, in his own words.

“ When the patient is feverish, or plethoric, I always begin with bleeding ; and if the fixed pains and the fever

M m

“ seem

“ seem to indicate a considerable inflammation, I repeat it.
“ I have thought, that giving four or five grains of ipeca-
“ cuanha with one grain of emetic tartar, without drink-
“ ing after this dose, but suffering it of itself to work off,
“ and repeating it in two hours, with orders to the pa-
“ tient to wash his stomach with camomile-tea, was the
“ best method of clearing the first passages. Sicknefs at
“ the stomach, bad taste in the mouth, giddinefs, heart-
“ burn, and severe gripes were reasons for repeating the
“ vomit on any of the following days. If the stomach
“ did not seem much disordered after it, I used to purge
“ with two ounces of manna and one ounce of *Glauber’s*
“ salt dissolved in a quart of water, whereof a quarter of
“ a pint was drunk every half hour till it procured two or
“ three copious stools. This I preferred to rhubarb and
“ to every other cathartic, especially in the beginning,
“ repeating it every third or fourth day, till the gripes
“ &c. abated; and giving an opiate every night, after the
“ first or second dose of the phytic. But I never knew an
“ opiate of use whilst the fever, the thirst, the gripes,
“ and *tenesmus* were considerable. If astringents were use-
“ ful, it was only when a laxity of the bowels remained
“ after the disease.”

By this account, we find that Dr. *Huck* not only divided the ipecacuanha, but to each of the doses added some emetic tartar, which upon a comparative trial was found to improve the medicine. And indeed for the future, I should prefer this method, as there is reason to believe,

from our observations upon the bilious fevers, that this antimonial medicine may be of service in removing some feverish spasms, which, though not the original cause, may concur with it in supporting the disease.

We may likewise observe, that Dr. *Huck* thought the salts and manna a better purge than rhubarb, in the beginning of the dysentery; but in talking with him on this subject, I found, that though he had frequently given rhubarb by itself, he had never given it with calomel, and therefore that he could not determine whether his purge or mine were the best in this state of the distemper.

I likewise understand, that most of the physicians employed in *Germany*, during the late war, preferred salts and manna (to which they frequently added some oil) to rhubarb alone; and that after bleeding and vomiting, they usually kept the body open with that medicine*. Possibly there may be better ways of giving the rhubarb than with calomel. *Degner* praises a tincture of it in a watery *menstruum*, of which he gave small but frequent

* DR. MONRO, one of the physicians on that service, told me, that he had commonly giving this purge in the dysentery:

R *Mannæ* ʒß. vitelli ovi ʒi. contritis simul, in mortario lapideo, admisce paulatim olei olivarum ʒvi. salis cathartici amari (aquæ puræ ʒiij. soluti) ʒj.

This was the dose for a strong person; but to the weakly patients he gave a smaller quantity. DR. ARMSTRONG and DR. TURNER also informed me, that they had used much the same composition.

doses: but as I never saw his treatise till after the conclusion of the former war, I have since that time met with too few rebellious cases, to induce me to compare his preparations with those remedies which I had used before with tolerable success *.

After clearing the first passages in the manner described, I have generally endeavoured to finish the cure by combining purges with opiates, in such a manner as to keep the body open, and at the same time to appease the gripes, but I have not always succeeded to my wish. In the year 1760, the brigade of guards arriving in *Germany*, about the end of July, in a rainy season, and when there was a scarcity of straw for the tents, such numbers of the men were taken ill, and for the most part with the dysentery, that when the camp broke up in the month of December, above half of that corps were unfit for duty. Mr. *Paterfon* (one of the master-surgeons to the hospital, then a mate in the guards) who gave me this information, told me that he had been generally successful, by

* It may seem strange, that authors have not yet agreed about the proper purge to be used in the dysentery; but we ought to consider that different constitutions require different laxatives. A physician, in his first practice, not attending to this, and meeting with a dysenteric patient, with whom rhubarb, for instance, agrees, and sena or salts disagree, will be afterwards apt to adhere to the first and condemn the other; and *vice versa*. But upon the use of purges in this disorder, and the variety of them occasionally to be employed, according to the difference of constitutions, as we have such full and just reflexions in *YOUNG's Treatise on Opium* (in his section on the dysentery) I shall not further insist on the subject, but refer the reader to those judicious observations.

treating

treating those of his battalion, who had been ill of the flux, in the following manner. “ If the patient was of a plethoric habit and very feverish, he began with bleeding; then gave a vomit of ipecacuanha; and besides that, if he had seen the sick person early in the day, a drachm of rhubarb at night for a purge; if not, the next morning. In the evening of the second day, after the operation of the physic, he gave about twenty drops of laudanum, or about ten grains of the *pilulæ saponaceæ*. After that, if the disease continued, he formed a mass of *theriaca* and *rhubarb* into the consistence of pills, and of this administered half a drachm morning and evening, and sometimes thrice a day.” Mr. Paterson added: “ That, the next year, when he himself was seized with the bloody-flux, he had followed the same method of cure. That it was near three weeks before he recovered, being constantly kept in camp, frequently marching, and being exposed to cold, wet, and other hardships in the course of his duty; but that during all the time, he had found the greatest benefit from the medicine above mentioned. That about half an hour after every dose the *teneſmus* abated, and the stools became more copious and less frequent for three or four hours following. That on this account, for the last seven or eight days, he took half a drachm of the above composition thrice a day, which amounted to

“ about

“ about one drachm of *theriaca* and half a drachm of rhu-
“ barb in the twenty-four hours.”

If by the means above mentioned, or by other methods, the disease is so far changed that the patient complains less of gripes and *tenesmus*, and begins to have stools, though loose, yet of a natural colour, with less slime and more *feces*, he being then in a fair way of recovery, his case will be further considered when I come to treat of the third state of the disease. At present I am to speak of those who have gone through the first state, and who either have had no medicine at all, or received little or no benefit from it; and when their stools are as small, as frequent, as slimy, and as painful as ever.

II. IN the *second state*, though there be often more of a hectic fever than at first, and though a mortification be threatened by the retention of the putrid matter and the continuance of the inflammation, yet, so far as I have observed, bleeding is not the remedy, but laxatives (such as have little irritation, and yet are sufficient to prevent an accumulation of the sharp humours) and those medicines which either sheathe the bowels against the acrimony, or procure a respite from pain and spasms till nature acquires force sufficient for the cure. Here for the first time I used the *sal catharticus amarus* alone, though probably it might have been more effectual with oil and manna, or given, not at once but in small and repeated doses,

doses, as in the *ileus* *. In this state I once gave, to a young woman five grains of ipecacuanha with twelve of rhubarb, which first making her sick, and then working downwards, brought away some *feces* of a natural colour, and gave a favourable turn to the disease. But as this person was one of my latest patients in a dysentery, I have had no opportunity of repeating that medicine.

At this period of the flux, finding emollient and anodyne clysters to be of considerable benefit, I therefore used a decoction of linseed, or of starch, or fat mutton broth, from four to eight ounces, according as a smaller or larger quantity could be retained. When the motions were so frequent, that the patient could not keep these clysters, I added to each from twenty to sixty drops of laudanum, or as much as was necessary for abating the irritation, without too much affecting the head. As the patient must use opiates, this will probably be found the best way of giving them; for thus they are applied directly to the *rectum*, where the irritation is the greatest. But in bad cases the motions are generally so frequent, that, notwithstanding the laudanum, one clyster given in the evening may be insufficient for composing the patient throughout the night; and if so, he must either have another, or take the common opiate. Although the advantage of clysters be considerable, yet we cannot

* See page 151.

avail ourselves of them, in the hospital, so often as could be wished, partly through the neglect of the nurses, and partly through the reluctance of the men to use them: even in private practice, we must often desist from clysters on account of the tenderness of the parts.

For mitigating the gripes and expelling the wind, we are not to use the warmer carminatives; at least I have never known them to answer. Opiates give immediate relief, but they only palliate, and often increase the cause. I have met with no remedy that remarkably answered this intention: the best, was fomenting the belly, and drinking camomile-tea. The infusion of these flowers was first thought of on account of their antispasmodic and bracing qualities, but having since found them a powerful antiseptic, I am inclined to think that some of their effects may be owing to that principle. The fomentations were made of the common herbs, with the addition of some spirits; but as they required frequent repetitions, they were less used by the soldiers than by the officers, who were better attended. The flatulent pains would sometimes affect the side, as in a pleurisy; but a laxative medicine, or the fomentations just mentioned, removed them without bleeding.

When the patient complained of a heart-burn, and of every thing turning sour on his stomach, I ordered from time to time four spoonfuls of the *julepum e creta*; and when at the same time the gripes and incessant motions required

required some palliative, I dissolved two grains of *extractum Thebaicum* in a pint of that julep, and gave it in the manner mentioned before *.

At other times, when there was no complaint of an acid but of gripes and frequent motions, I endeavoured to blunt the acrimony, and in some degree to sheathe the bowels against the irritation, by food of a mucilaginous quality (which shall be mentioned hereafter) and by giving for drink, a decoction of starch with gum arabic, seasoned with some simple cinnamon water and sugar. A pint of this liquor commonly contained three drachms of starch with half an ounce of the gum. For the same intention, a solution of wax was used in the hospitals in *North-America*, and, as Dr. *Huck* tells me, often with good effects †. Preparations of wax have been long in repute for their virtues in this disorder: *Bates* recommends a solution of it in spirits ‡; and *Diemerbroeck* gives instances of its extraordinary effects, when dissolved in milk, and men-

* Page 207.

† R *Ceræ flavæ rasæ* ʒiβ. *saponis Hispani duri rasæ* ʒi. *aquæ puræ* ʒi. *liquefiant leni igne, et assidue agitentur donec in unum coeant; dein effunde materiam in mortarium lapideum, eique paulatim admisce aquæ puræ* ʒviiij. *aquæ nucis moschatæ* ʒj. *et sacchari albi quod satis sit ad gratum saporem.*

This makes a smooth mixture of no disagreeable taste, whereof the patient takes as much at proper intervals, as to consume the whole quantity in a day, which is then to be renewed. The soap is only used as a dissolvent of the wax.

‡ Pharmacop. BATEAN. in formulâ *Butyrum Ceræ.*

tions some other authors who praise this medicine for the dysentery*.

When the flux continues till the strength is much impaired, and the pulse sinks whilst the hectic heat remains, the case becomes very dangerous; though there are still hopes, as long as there are neither involuntary stools, nor *aphthæ*, nor a hiccup; and when the patient does not complain of great lowness, and the *anxietas præcordiorum*: for then the case is bad indeed, and scarcely admits even of palliatives; since opiates have but little effect, either in easing the pain, or checking the frequency of the stools. Sometimes the disease is complicated with the hospital-fever; in which case few recover. But when there is room for medicine, I have commonly used a decoction of the Bark with Snakeroot (described in the next chapter) to which I added a few drops of laudanum. At other times, and especially when the pulse was sunk, I have experienced the good effects of the following decoction, of which four spoonfuls were given every four or five hours:

R Radicis serpentariæ Virginianæ contusæ ʒiij. coque ex aqua pure ʒxij. ad ʒviij. adjecta sub finem coctionis theriacæ Andromachi ʒj. cola.

In the year 1760, Dr. Whytt wrote to me: "That in this bad state of the dysentery, when the mouth and ali-

* Observat. et Cura: Med. obs. xxviii.

“mentary canal were threatened with *aphthæ*, and even
“sometimes after they appeared, he had successfully giv-
“en the Bark; having first made such evacuations as the
“case required, or the patients could bear, by bleeding,
“vomiting with *ipécacuanha*, and purging with *rhubarb*.
“That to a pint of a strong decoction of the Bark, he ad-
“ded three drachms, or half an ounce of *confectio Japonica*
“(a composition of the *Edinburgh* dispensatory of the
“same intention with *diascordium*, but simpler) and or-
“dered two spoonfuls, every four hours, of this medicine,
“without any other, except some laudanum at bed-time.
“That when by the continued use thereof the body be-
“came costive, he then gave *rhubarb*; and after that,
“went on with the decoction of the Bark, but with less
“of the *confectio*, or even without it”.

At this time, supposing that the *rectum*, from the irrita-
tion occasioned by the incessant motions, tended to a mor-
tification, I endeavoured to quiet the spasms by repeated
anodyne clysters, but without any antiseptic ingredient.
Something however of that kind has been tried by others.
For, Mr. J. Hunter, one of the master-surgeons on the ex-
pedition to Portugal, told me, that he had frequently used
antiseptic clysters with good effect, when the patient
was worn down with continual motions and the *tenesmus*.
His first trial was with four ounces of a strong decoction
of the Bark, in which he dissolved some grains of opium;

and afterwards, he found that a decoction both of the tormentil-root, and of oak-bark, with opium, answered the same purpose. He added, that these clysters were repeated often, and especially if they came away at first without having had the desired effect.

Hitherto I have said nothing of the diet, as it was nearly the same in both these states of the disease. It consisted chiefly of rice or barley-gruel, sago, panada, and some puddings; and to those who were but a little feverish, some mutton broth was allowed: but this last article was omitted afterwards, as I observed that, in general, animal food was improper. For drink, I ordered rice or barley-water, toast and water, or the decoction of calcined hartshorn. During the former war, we used no salep in the hospital. Although that root has been accounted specific in the distemper, yet from my own experience I can say nothing particularly in its commendation. Mr. Triquet, surgeon-major to the second regiment of guards, told me (at the camp in the isle of *Wight*, in the year 1758) that in his regimental hospital, no kind of diet agreed so well with the men, who were ill of fluxes, as a mess made of flour boiled in milk, sweetened with sugar, and taken for breakfast and supper. But though all these substances are of the softest, and least heating kind of food, yet I have observed, that for the most part the patient could not eat any of them, nor swallow any of the liquors

liquors mentioned above, nor almost any other, except plain warm water, without being sick or griped immediately after. It was therefore natural to conclude, that until the stomach and bowels were able to bear some stronger nourishment without sickness or pain, nothing but water should be given for the whole diet. In this notion I was confirmed by some curious observations on the dysentery, communicated to me about ten years ago by *M. de Senac*, who, during my service in the *Low-Countries*, in the former war, was physician-general to the *French* army, and who by that means became well acquainted with the distemper. That learned physician informed me, that having had good evidence for believing that several had been cured by only drinking large quantities of warm water for five or six days together, he had successfully made the experiment upon himself, and upon fourteen more who submitted to this regimen. He added, that after having tried several other methods, without being satisfied with any of them, he had at last fallen upon one which had answered to his wish, and by which he had made numberless cures. This, after evacuations by bleeding and by a vomit of emetic tartar, consisted chiefly of one grain of emetic tartar dissolved in a pint of common whey, or chicken-water, given every day, for all food, drink and medicine till the patient recovered. His intention was to keep a free passage from the stomach to the *rectum* by the mildest laxative, and which he found was best answered by that minute quantity

tity of the antimonial*. In case the gripes proved more obstinate than usual notwithstanding the evacuations, he then endeavoured to quiet them by giving some syrup of white poppies every night at bed-time. But though this course (in which the lowness of the diet is a material circumstance) was not only agreeable to my sentiments upon the nature of the disease, but was recommended to me by a person in whose judgment and veracity I had intire confidence, yet I have never been able to avail myself of the communication, on account of the difficulty, I may say the impossibility, of making the people of this country submit to so low a diet, even for a few days.

Under the article of diet, must not be omitted a caution with regard to the kettles of the hospital, which are all made of copper tinned; but as the tinning soon wears off, the metal is corroded by every thing that is salt or acid; and we may well imagine how apt the nurses will be to let such things stand long in those vessels, and to neglect cleaning them before they are again used. It is to be presumed that this is often the cause of mischief, and especially during the dysenteric season, when the stomach and bowels are otherwise so much affected. Therefore,

* As the emetic tartar is not every where made to the same standard, it is easily understood that the laxative dose must vary according to the preparation of that medicine.

one considerable improvement in the military hospitals would be, to have a Brasier constantly attending.

III. I come now to the *third state* of the disease, in which the patient, though seemingly recovering, is kept low by a *tenesmus*, almost his only complaint, or by frequent returns of a looseness, through the weakness of his bowels.

The *tenesmus* is not always owing to one cause. Sometimes I have known it occasioned by the hard *scybalæ* formerly mentioned, which coming away in small parcels, for several days together, have made a constant irritation. The discharge of these, I have hastened by an ounce of Glauber's salt dissolved in half a pint of water, and given at different draughts in a morning. If one or two such doses have no effect, the continuance of the *tenesmus* must be imputed to an excoriation, or some sore of the *rectum*, by which the part becomes so tender as to be irritated by the humours of the intestines, though perhaps they may now be restored to a sound state. For medicine, if the *tenesmus* is great, and the motions frequent, we must still have recourse to opiates, and especially to the anodyne clysters first mentioned*. In every case of great irritation, during this state of the disease, I used formerly to give the decoction with starch and gum Arabic, described above†, but of late I have more frequently prescribed mutton-suet, prepared according to the following receipt,

* See above page 271.

† Page 279.

which

which has been for some time in use here: "Take two
 " ounces of fresh suet, and a pint of new milk, set them
 " over a slow fire, and let them be stirred till they boil,
 " then add a heaped spoonful of starch finely powder-
 " ed, and mixing it well with the rest, let them boil
 " a little together." This preparation may be sweet-
 ened or not, according to the taste. The whole quan-
 tity may be consumed in a day; and it will have the bet-
 ter effect if the patient takes no other aliment. I have
 sometimes attempted to give this medicine in the first
 and second state of the disease, but it never answered;
 for, at that time the stomach was too much disordered to
 bear it.

Sydenham has said that the *tenesmus*, at the end of a dy-
 sentery, is never occasioned by an ulcer in the *rectum*; in
 which he is corrected by *Morgagni*, who mentions one
 case to the contrary that had occurred in his own prac-
 tice*: but by quoting that case only, it appears that *Mor-*
gagni knew but of few exceptions to *Sydenham's* rule,
 which indeed, from my own observation, I should reckon
 a pretty general one.

As to the frequent returns of purging, we are not, as I
 observed before, to consider them so much as relapses
 into the dysentery, as into a *diarrhoea* or white-flux, owing
 to the weak state of the bowels.

* De Sed. et Caus. Morb. ep. xxxi. sect. 27, 28.

Whenever therefore the patient is in this condition, I begin with giving a scruple of ipecacuanha, and the next day, I put him upon a course of those medicines which, from their effects in stopping a looseness, have been called astringents. For this purpose, during the former war, I commonly used the following mixture :

R *Extracti ligni Campechensis (ex aquæ cinnamoni spirituosæ*
℥i℥. triti) ℥iij. aquæ puræ ℥vij. tincturæ Japonicæ ℥ij. misce.

Of this the patient took two spoonfuls once in four or five hours, and sometimes also an opiate at bed-time. I understand that in one of the hospitals of this city, where this *formula* is used for old and obstinate diarrhoeas, and for dysenteries not yielding to the common methods, they order, at the same time, a bolus to be taken every night, consisting of a scruple of *philonium Londinense* with two grains of ipecacuanha, and that with these two medicines they have been generally successful.

Since that war, having read the account which *Degner* and others had given of the virtues of the *simaruba*, I made a few trials of that medicine, and which were mostly in its favour. *Degner* not only recommends it as a mild restringent, but as a corrector of the bile ; for, according to his theory, the depravation of that humour was the cause of that epidemic flux which he treats of. On that account he gave it early in the disease, whilst the gripes and tenes-

mus continued, and whilst blood was yet found in the stools. But from my experiments, I could discover none of the salutary effects of the *simaruba* before the third state. Dr. *Huck*, who had used it often in *North-America*, told me, that he had never seen it answer in the beginning, nor even in the advanced state of the disease, till the gripes and *tenesmus* had in a great measure ceased, and till the blood had disappeared in the stools; but that when only a looseness remained, he had often found it succeed. This was his formula:

R Corticis radicis *simarubæ* zij. vel iij. coque ex aquæ puræ sesquialibrâ ad libram, et cola.

This quantity was given every day in several draughts. He began with the weakest decoction, and when the patient's stomach could easily bear it, he then ordered him the strongest. Dr. *Huck* observed, that unless the sick found themselves sensibly better within three days from the time they began the medicine, they seldom afterwards received any benefit from it. Dr. *Mitchell*, who formerly practised in *Virginia*, where the dysentery is frequent, also informed me, that he had likewise used this vegetable, but not with success, except when the patient either voided an immoderate quantity of blood during the height of the disorder, or had a *diarrhoea* after the inflammatory state was passed. He added, that he had usually made a stronger decoction than that which *Degner* prescribed, who probably

was led to give the *simaruba* with more caution, as the bowels were so much inflamed when he began it.

I have also known good effects from small doses of ipecacuanha joined to opiates, such as two grains of that powder with fifteen of the *philonium*, taken twice a day. Others have received benefit from ipecacuanha alone. Dr. *Huck* observed, that a soldier, after getting over the inflammatory state of the dysentery, was much reduced by a white-flux of the lenteric kind; and that after giving him several astringents without effect, he had at last succeeded, by ordering him six grains of ipecacuanha in powder, to be taken every morning fasting; that this man was puked by the medicine for the first three or four days only, but that he afterwards took it without complaining that it made him sick.

During this astringent course, the men are still to be attentive to their diet, abstaining from greens, fruit, malt-liquor, and acids. In this state I have allowed them some flesh meat, and for drink, water mixed with a little rum or brandy: to the officers and private patients, I have given some wine when they were very desirous of it. But from further experience, I am convinced, that at this period of the disease, the cures would be both more frequent and speedy, could we prevail upon our patients to abstain altogether from animal food, and from vinous and spirituous liquours: for, when no

astringents have availed, I have frequently known the cure obtained by a milk and vegetable diet without them.

Therefore when the astringents fail, and especially when the pulse is quick, and the patient complains of inward heat, I first give a vomit of ipecacuanha, and then begin that low regimen, which I continue till the hectic symptoms have ceased, and the bowels have recovered their tone. During this new course, I have seldom had occasion for medicines, excepting the chalk-julep mentioned before, which I use for correcting that strong acid so incident to relaxed stomachs. Sometimes I add an opiate, in order to procure rest at night; but after a few days both these are laid aside. All that I require (which indeed is often hard to obtain) is a strict perseverance in the diet; and now and then a repetition of the vomit, upon any new disorder of the stomach, or greater laxity of the bowels.

Whilst the patient continues in this state, I forbid all animal food; and besides milk, I allow only the preparations of grain, fago, and salep. In large hospitals the soldiers cannot be fully supplied with milk; but in such circumstances they must be contented with a smaller quantity, and with the other parts of diet here prescribed; without eating cheese, eggs, or other things which are heavy or heating to men in their condition. Although greens and fruit may seem to favour the general intention of cooling, yet as they are mostly loosening, I have thought that the
use

use of them at this time was less proper ; but it is possible, that upon further experience we may find some kinds both of the one and the other conducive to the cure. And I am the rather inclined to this opinion, from having observed in one of the latest cases, that when the patient drank butter-milk, he received more benefit than could have been expected from sweet milk ; though the other, from an acidity, resembling that of some fruits, might be supposed to be contrary to the nature of the disease.

In this regimen I allow of neither fermented liquors nor spirits. The chief drinks are the decoctions of barley, of rice, or of calcined hartshorn, toast and water, or milk and water. Having observed in my private practice, that some were better for drinking *Bristol-water*, not only at the spring but at a distance, I desired one of my patients (who had come from the *Havannah*) to observe whether he found any difference between drinking the river-water and the pump water in this city ; and after some trials he assured me, that he was less liable to a return of his flux when he used the latter. Now *Bristol-water* and most of the pump-water in *London* agree in not lathering with soap ; that is, in being in reality hard, however soft they may be to the taste. But I would not from thence infer, that this mineral water has no other advantage than hardness, when drunk warm at the spring, considering how long it has been in repute for its efficacy in cases of this kind, especially when hectic heats were joined.

Pure

Pure air, being of such consequence in the cure, the physician can scarce be successful in full hospitals unless the wards be uncommonly well aired. The best expedient in the dysenteric season, is to divide the sick, and lay them in churches, or in barns, or in ruinous houses only, where neither they nor their nurses can confine the air. Not but that expositions to cold are hurtful, and that a constant free perspiration is favourable to the cure; but when warmth is not to be had with a purity of air, we must chiefly regard the latter. Not only in the camp, but in the hospitals, the privies should be covered every day with a layer of earth; and at these times, particularly, the wards should be fumigated and kept clean. Such men as have long languished in the hospital under a hectic, and a laxity of the bowels, have been surprizingly restored by cantoning them in the country, for the benefit of milk and the fresh air.

Lastly, as conducive to the cure, and as a preservative against a relapse, especially when the weather begins to grow cold, the convalescents ought to be provided with under-waistcoats: some of the officers who were subject to relapses have informed me, that they found great benefit from wearing a flannel waistcoat next their skin.

C H A P. VII.

Observations on the jail or hospital-fever.

I Come now to the last fatal distemper incident to an army, namely the hospital-fever. In treating of this, I shall, 1. describe its rise, and the manner of the infection; 2. the symptoms; 3. the prognostics; 4. the dissections of some of those who died of it; 5. the method of cure: and lastly, from these and other materials, I shall inquire into the causes of such fevers.

§ 1.

Of the rise of the jail or hospital-fever, and the manner of the infection.

THE hospitals of an army, when crouded with sick, or when the distempers are of a putrid nature, or at any time when the air is confined, especially in hot weather, produce a fever of a malignant kind, and very mortal*. I have observed the same sort to arise in full and crouded barracks; and in transport-ships, when filled beyond a due number, and detained long by contrary winds;

* Part i. ch. ii. ch. iii. ch. iv. ch. viii. Part ii. ch. ii. § iii.

or when the men have been long kept at sea under close hatches, in stormy weather. Hospital-ships for distant expeditions have, for this reason, been generally destructive both to the sick and their attendants.

As soon as I became acquainted with this fever in the hospitals abroad, I suspected it to be the same with what is called here the *jail-distemper*, which I had never seen, and was confirmed in my opinion by having an opportunity of comparing them, furnished by an accident mentioned in the first part of these observations *.

This disorder is incident to every place ill-aired and kept dirty, that is, filled with animal steams from foul or diseased bodies. And upon this account jails and military hospitals are most exposed to this kind of pestilential infection, as the first are in a constant state of filth and impurity, and the latter are so much filled with the poisonous *effluvia* of sores, mortifications, dysenteric and other putrid excrements. I have seen instances of its beginning in a ward, when there was no other cause but one of the men having a mortified limb. Nay, there is reason to apprehend, that when a single person is taken ill of any putrid disease (such as the small-pox, dysentery, or the like) and lies in a small and close apartment, he may fall into this malignant fever. This I have

* Page 36.

known happen in the camp, when any one who has been seized with such a disorder, has kept his tent too close. But, excepting a few of these occurrences, this fever is not properly one of the camp-diseases, though it be universally accounted such; for being frequently seen in camp-hospitals, it is therefore erroneously supposed to come from the field.

I have observed some instances of a high degree of contagion attending it; but the common course of the infection is slow, and catching to those chiefly who are constantly confined to the bad air, such as the sick in hospitals, and their nurses, and prisoners in jails. But when there is no great quantity of infectious matter, or when a person has not breathed long in such dangerous steams, or when it is not particularly virulent, he will either escape, or have the symptoms come on so slowly as to leave time for prevention before the fever be formed. Much will also depend on the constitution: some will have the disorder hanging about them for several days before it confines them to their bed; others will complain for weeks of the same symptoms without any regular fever; and others, after leaving the infectious place without the fever, may afterwards be seized with it*.

* Part i. ch. vi.

§ 2.

Of the symptoms.

WHEN the distemper comes on slowly, the first complaints are small interchanges of heat and cold, a trembling of the hands, sometimes a sense of numbness in the arms, weakness of the limbs, loss of appetite; and the disorder being greatest at night, the body is hot, the sleep interrupted and not refreshing. With these symptoms there is some pain or confusion of the head, but never violent. The pulse is at first a little quicker than natural, the tongue is white, but the drought is inconsiderable. Those who are thus affected find themselves too much indisposed to go about business, but too well to be wholly confined. In this state, sometimes a vomit, sometimes a change of air will remove the disorder, sometimes a sweat: I have had experience of the two last methods of preservation in my own case.

The disease is not easily to be distinguished, in the beginning, from any common fever*. I have observed the *tremor* of the hands to be one of the most constant signs: but in order to form our diagnostics we must take other

* Febres malignas in principio statim cognoscere difficile est, cum malignitas sæpe diu lateat, et non nisi ubi vires sum sit sese prodant. SENNERT. Epit. de Febr. lib. iv. cap. x.

circumstances into consideration. We are to inquire whether the person has been exposed to the usual causes of fevers, or to foul air and infection; as also, if he has been bled, whether he has been relieved by the evacuation; because, in inflammatory fevers, bleeding generally moderates all the symptoms, but in this it seldom has that effect.

When the fever advances, the symptoms already mentioned are in a higher degree, and in particular the patient complains of great lassitude, of a *nausea*, pains in the back, a more constant pain and confusion in the head; and then we perceive an uncommon dejection of spirits. At this time the pulse is never sunk, but beats quick, and often varies, in the same day, both as to strength and fulness. The pulse is little affected by once bleeding, if a moderate quantity of blood be taken away; but if the evacuation be large, and especially if repeated to answer a false indication of inflammation, the pulse increasing in frequency is apt to sink in force, and often irrecoverably, whilst the patient becomes delirious. But withal we must observe, that in every case, independent of evacuations, the pulse sooner or later sinks, and gives then certain indication of the malignity of the disease.

The appearance of the blood is various; for, though commonly it is little altered, yet it is sometimes fizy, both upon the first attack, and after the fever is well formed. The worst appearance is when the *crassamentum* is resolved;

though this does not happen till the advanced state of the disease: but as blood has been so seldom taken away at that period, I cannot tell whether this be a frequent occurrence or not.

The urine is also various. Sometimes it is of a reddish or flame-colour, which it preserves a long time; but it is oftener pale, and varies from day to day in colour as well as crudity, being sometimes clear, sometimes clouded: towards the end, upon a favourable *crisis*, it becomes thick, but does not always deposite a sediment.

If the sick lie warm, and have had no preceding flux, the body is generally costive; but when they lie cold, as they often do in field-hospitals, the pores of the skin being shut, a *diarrhoea* is a common symptom, but is not critical. In the worst cases a flux appears in the last stage; then the stools are involuntary, colliquative, ichorous, or bloody, and have a cadaverous smell, the effects of a mortification of the bowels, and the sign of approaching death. When the hospitals are filled with dysenteries, some of the nurses will be infected with the flux only, and others with this malignant fever ending in these bloody and gangrenous stools.

In the beginning, the heat is moderate; and even in the advanced state, on first touching the skin, it seems inconsiderable; but upon feeling the pulse for some time,
I have

I have been sensible of an uncommon ardour, leaving an unpleasant sensation on my fingers for a few minutes after *. The first time I observed this, I referred it to the force of imagination; but I was assured of the reality by repeated experiments, and by the testimony of others, who, without knowing of my observation, had made the same remark. A day or two before death, if care be not taken, the extremities become cold, and the pulse is then hardly to be felt.

The skin is generally dry and parched, though sometimes there are shorter or longer sweats, especially in the beginning. Such as are produced by medicine are of no use except on the first attack, at which time they will often remove the fever; but such as are natural are never critical till the distemper begins to decline. These last are rarely profuse, but gentle, continued, and equally diffused over the body: sometimes the disease will terminate by an almost imperceptible moisture of the skin. The sweats are usually fetid, and even offensive to the patient himself.

The tongue is mostly dry, and without constant care of the nurse becomes hard and brown, with deep chops: but

* GALEN, describing the autumnal remitting fevers, makes the same remark about the heat. ‘*Febrium, quæ a putredine oriuntur, maximum indicium est mordacitas et*

‘*acrimonia caloris; quæ perinde ac fumus nares et oculos, sic ipsa erodere tactum videtur....*

‘*Non statim ea qualitas, admotæ manu, discernitur, ac per moram prædicta caliditatis*

‘*species effertur ex penitioribus partibus.*” LACUN. Epit. GALEN. de Differ. Febr. lib. i. cap. vii.

this

this symptom is common to most fevers. It may be particular to this, that sometimes the tongue will be soft and moist to the last, but with a mixture of a greenish, or a yellowish colour. The drought is sometimes great, but more frequently moderate. In the advanced state, the breath is offensive, and a blackish furring gathers about the roots of the teeth.

Some are never delirious, but all are under a *stupor* or confusion. Few retain their senses till death; many lose them early, and from two causes; either from immoderate bleeding, or the premature use of warm and spirituous medicines. They rarely sleep, and, unless delirious, have more of a dejected and thoughtful look than what is commonly seen in other fevers. The face is late in acquiring either a ghastly, or a very morbid appearance; yet the eyes are always muddy, and generally the *white* is of a reddish cast, as if inflamed. The confusion of the head often rises to a *delirium*, especially at night; but unless by an unseasonable hot regimen, it seldom turns to rage, or to those high flights of imagination frequent in other fevers. When the *delirium* is at this height, the face is flushed, the eyes are red, the voice becomes quick, and the patient struggles to get up. But when that disorder is owing to large evacuations, or only to the advanced state of the disease, the face appears meagre, the eye-lids in slumbers are only half shut, and

and the voice, which is commonly flow and low, sinks to a degree scarce to be heard. From the beginning, there is generally a great dejection of mind and a failure of strength.

A *tremor* of the hands is more common than a starting of the tendons; or if the *subfultus* occurs, it is in a lesser degree than in many other fevers. In every stage of the disease, as the pulse sinks, the *delirium* and *tremor* increase; and in proportion as the pulse rises, the head and spirits are relieved. Sometimes, from the very beginning, the patient grows dull of hearing, and at last becomes almost deaf.

When the fever is protracted, with a flow and low voice, the sick have a particular craving for something cordial; and nothing is so acceptable, and so cordial as wine. They long for no food, yet willingly take a little panada if wine be added. But such as are delirious, with a quick voice, wild looks, a *subfultus tendinum*, or violent actions, though their pulse be sunk, bear neither hot medicines, wine, nor the common cordials.

Vomiting, and complaints of a load and sickness at the stomach, though usual symptoms, are not essential to the disease; nor are pleuritic stitches, difficulty in breathing, or flying pains to be referred to it, so much as to the constitution of the patient, or to a preceding cold.

There

There is a certain eruption, which is the frequent, but not inseparable attendant of the fever. This is a petechial efflorescence*, that is sometimes of a brighter, or paler red, at other times of a livid colour, but never rises above the skin†. The spots are small, but sometimes so confluent, that at a little distance the skin appears only somewhat redder than ordinary, as if the colour were uniform; but upon a nearer inspection the interstices are seen. For the most part these spots are so little conspicuous, that, unless looked for attentively they may escape notice. They come out thickest on the breast and the back, less on the legs and arms; and I do not remember to have observed any upon the face. I have sometimes seen them as early as the fourth or fifth day, and at other times as late as the fourteenth. They are never critical, nor are they to be reckoned among the mortal signs, but only concur with other circumstances to ascertain the

* It is doubtful whether the ancients knew any thing of these spots, and the fever which they accompany; but among the moderns, they were, so far as I know, first described by FRACASTORIUS, under the names of *Lenticulæ*, *Puncticula*, or *Peticulæ*; for by all these, both the fever and the spots were commonly called in his time. “*Sunt et aliæ febres, quæ mediæ quodammodò sunt inter verè pestilentes et non pestilentes... quales illæ fuere quæ annis 1505, et 1528, in Italiâ primùm apparuere atate nostrâ non priùs notæ, certis verò regionibus familiares, ut Cypri et vi inis insulis, majoribus etiam nostris cognitæ, vulgus Lenticulas, aut Puncticula appellat, quòd maculas proferant lenticulis, aut puncturis pulicum similes. Quidam mutatis literis Peticulas dicunt.*” FRACAST. de Morb. Contag. lib. ii cap. vi.

† For this reason they are not to be referred to any of the *ecthymata* of the ancients, which denote pustules or eruptions higher than the skin, as in miliary fevers, with which this malignant fever is not to be confounded.

malignity.

malignity. The nearer they approach to a purple, the more they are to be dreaded. In a few cases, instead of spots, I have observed purple streaks and blotches, which perhaps are still a worse symptom. The *petechiæ* will sometimes not appear till after death *; and we had a case in the hospital, in which, upon bleeding, these spots were seen on the arm, below the ligature, and no where else on the skin.

This fever, though of the continued kind, yet has generally sensible exacerbations at night, with remissions and often partial sweats in the day; and after a long continuance, it is apt to change into a hectic, a remitting, or an intermitting form.

The length of the disease is uncertain. I have known it end either in death, or recovery in seven days; but in the hospitals it generally continued from fourteen to twenty days †; and some died, or recovered, after four weeks illness. From the time of the sinking of the pulse till death, or a favourable *crisis*, there is perhaps less change to be seen from day to day in this, than in any

* A circumstance incident to the plague. *Vid.* DIEMERBROECK *de Peste. lib.* iv. *hist.* v.

† DR. CLEPHANE observed, that the most sensible change to the better was generally upon the 17th day, from the time the patient found himself so ill as to keep his bed. The common period of the fever is the more diligently to be attended to, as we can scarce expect a *crisis* before that time, excepting upon a relapse, and then I have observed the course to be commonly shorter.

other fever not of the malignant kind. When the course is long, it sometimes terminates in suppurations of the parotid*, or axillary glands; and when these do not appear, it is probable that the fever is kept up by the formation of some internal abscess. Many, after the *crisis*, complain of a pain in their limbs and want of rest; and almost all of them mention great weakness, confusion in their head, *vertigo*, and a noise in their ears.

Having now related the most distinguishing marks of this fever, I shall only add, that there are sometimes slight degrees of it hardly to be described, and which can only be discovered in full hospitals, by observing the men to languish, though the nature of the illness, for which they came in, should seem to admit of a speedier cure. In such cases, they have a whitish tongue, they complain of slight headaches, of want of appetite, and other inconsiderable feverish symptoms.

§ 3.

Of the prognostics.

MEN who have been weakened by distempers, or other accidents (as those who have undergone a saliva-

* I remember one instance of both parotids swelling, without any previous indisposition, when the person, not suspecting the cause, and applying discutient cataplasms, was, upon the tumours subsiding, seized with the malignant fever. This happened to MR. FORBES, surgeon to the second troop of horse-guards, then a mate in the hospital.

tion) are more susceptible of the infection than the strong and vigorous, and run more risk. Those who are taken into crowded hospitals, with the small pox, however good the fort may be, and however well they may pass the height, fall readily into this fever, and die. One who has recovered is not less subject to a relapse, than he was to the distemper at first; but it has not been observed, whether such as have had abscesses are as liable to relapse as others. The second fever is attended with double danger, as the patient has been so much weakened by the first. A sure sign of the corruption of the air in an hospital is, when many of the nurses fall sick.

We cannot draw a prognostic from any sign by itself, and all of them together are more fallible in malignant fevers than in others. Generally, the following are good, to have little *delirium*; the strength little impaired; turbid urine in the decline of the disease; and at that time a gentle sweat or moisture diffused over the body; or even the skin soft, and the tongue moist; or to have then bilious stools succeeded by a *diaphoresis*; the pulse to rise by wine or cordials, with an abatement of the *stupor*, *tremor*, and other nervous symptoms. Deafness is rather a good sign. A sediment in the urine, without other changes to the better, is no sure mark of recovery; and some have recovered in whose water I had seen no sediment.

The bad signs are, a *subfultus tendinum*; the eyes much inflamed and staring; the speech quick, and the sound of the

voice altered; a high *delirium*; constant watchfulness; sickness at the stomach, and vomitings; frequent stools with a sinking pulse, and the disorder of the head increased; involuntary *æces*; coldness of the extremities; and a tremulous motion of the tongue. It is observed to be among the worst signs, when the patient complains of blindness; when he swallows with difficulty; or cannot put out his tongue when desired to do it; when he can lie on his back only, and pulls up his knees; or when insensible, he endeavours to uncover his breast; or makes frequent attempts to get out of bed. If to any of these are added ichorous, cadaverous and involuntary stools, it is a sign of a mortification of the bowels and approaching death.

It will not seem strange to find most of these prognostics common to the advanced state of other fevers, when we consider, that from whatever cause fevers begin, by a long continuance the humours are corrupted, and the brain and nerves affected much in the same manner as in those which arise from infection.

§ 4.

Of the dissections.

THE dissections of those who died of the common hospital-fever, or of *Houghton's* regiment, which had the distemper

temper from the jails, were in all ten. In some of the bodies, all the cavities were opened; in others, either the brain alone was seen, or the bowels. These imperfections of this part I thought proper to mention, that the accounts here given might not be considered as complete, or prevent others from pursuing the inquiry further.

The most unexpected appearances were abscesses of the brain, of which therefore I shall take more particular notice. The first I saw of this kind was at *Ghent*; but the man being brought into the hospital from the barracks, no more than two days before he died, I could only conjecture from the symptoms, and the imperfect account I had of him, that his death was owing to a fever of this kind, after lingering near a month in it. I found about three ounces of purulent matter in the ventricles of his brain, and observed that the whole cortical and medullary substance was uncommonly flaccid and tender. Nay, some of the same kind of matter was found in the substance of the upper part of the *cerebellum*: yet this person, with some *stupor* and deafness, had his senses till the night before he died, so far, that he answered distinctly when roused and spoken to; but about that time the muscles of his face began to be convulsed.

Of two other instances of men who undoubtedly died of this fever, in one the brain was suppurated; in the other, the *cerebellum*. In the former case, the patient was under a

stupor

stupor with deafness from the beginning, but was never delirious nor altogether insensible. His pulse sunk very early; and about ten days before he died, his head began to swell, and continued very large till within two days of his death, when it subsided a little. For several days before his end he would taste nothing but cold water; and during his illness he lay constantly on his right side. The head being opened, an abscess as large as an egg was found in the substance of the fore-part of the right hemisphere of the brain, full of thin matter like whey. At that time five more, ill of the same fever, had the like swelling of their heads, but recovered*. This extraordinary symptom I never observed before, nor since. In the other case, the abscess in the *cerebellum* was about the size of a small pigeon's egg, and contained also a thin ichorous matter: nor had this patient been ever so thoroughly insensible, as not to answer reasonably when spoken to. Two days before he died, his urine turned pale. Both these bodies were opened by Mr. *Breach*, apothecary in *Southwark*, then a mate in the hospital.

But suppurations in the brain were not constant; for, another who died about this time, and had been ill about the same number of days with the like symptoms, the pale water excepted, had no abscess either in the brain or

* This happened at *Inverness*, and all, or most of these men were of HOUGHTON'S regiment: see page 45 et seq.

cerebellum. And two were opened afterwards, in whom the cortical substance of the brain had an inflammatory appearance, but no suppuration. In one of them, the large intestines were corrupted: that man went off with a looseness; and just before his death he had a discharge of an ichorous matter from his nose. In the military hospital at *Ipswich*, one who unexpectedly died of this fever, after having been once in a fair way, had no suppuration in his brain. And about the same time Dr. *Clephane* told me, that he had seen the head of another opened, who died after an abscess in each of the orbits; that he had found the brain very flaccid, and about two ounces of a thin *serum* in the ventricles; but that neither of these two bodies had been further inspected.

I shall not enter into a description of other particulars in these dissections; for, though I have them written at length, it may be sufficient from what has been said to draw the following conclusions.

That as there is the greatest tendency to putrefaction through the whole course of the illness, it generally terminates, when it proves fatal, either in an actual mortification of some part, or in an abscess of the brain, often ichorous; that the intestines more particularly are subject to mortify, as few die without cadaverous and involuntary stools; and from an observation which we made, of
the

the *petechiæ* not appearing till after death, it seems reasonable to conclude, that those spots are owing to a resolution and a corruption of the blood. The putrid sweats and smell of the body, before death, are a further argument for what is now advanced. And as to the abscesses, so often found in the brain, the ichorous kind may be considered as a *species* of mortification proper to parts of that texture ; and from the preceding cases, it seems probable that these suppurations are not rare occurrences in this fever*.

From the inflammatory appearance of the brain without suppuration, we may account for the same remedies having sometimes opposite effects. For, though in the advanced state, wine and cordials are often the best medicines, yet there are some who cannot take them without increasing the *delirium*: such therefore have probably some considerable inflammation about the brain.

The last observation which I shall make upon the dissections is, that the great tendency of this fever to putrefaction reduces it to the pestilential class of diseases ; as all of that kind are remarkable for a prostration of strength, sunk pulse, dejection of spirits, putrid sweats and stools, *petechiæ*, livid blotches, and the like symptoms.

* From the numerous dissections of those who died of the last plague at *Marseilles*, it appeared that some of the *viscera* were always mortified and inflamed, and that the brain and lungs were most frequently affected in that manner. *Traité de la Peste*, part. i.

These are the inferences which we may reasonably draw from the dissection of the bodies: But from thence to ascertain the first morbid matter, where the effects only are seen, or to account for all the varieties of this fever, would be too great an attempt from such materials. Nor would it be just to propose our method of cure as deduced from the inspection of the dead bodies, since the most successful part of it was taken from the experience of others, or from trials of my own preceding most of these dissections.

§ 5.

Of the cure.

IN the cure of this fever, as in all others, we must vary our method according to the state of the disease. I shall therefore distinguish it into three states, and in each propose those remedies which I found to be the best from experience. Let us suppose the first state to continue as long as the person is able to go about; the second, to begin with his confinement, when the fever is manifest, the head somewhat affected, but the pulse still full; and the third, when the pulse sinks, and a *stupor* comes on, with the other symptoms already described.

I. IN the *first state*, as well as in all the rest, the fundamental part of the cure is to remove the patient out of the

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foul air. When that cannot be done, the room or ward is to be purified, by making a succession of air by means of fires, or letting it in by doors and windows, diffusing the steams of vinegar, or the like; for whatever medicines are given while the corruption of the air continues, or indeed increases by the *effluvia* of the sick, there can be little hopes of recovery. Therefore in every stage, though the patient should breathe no other infectious air but that of his own atmosphere, it will be necessary to keep the curtains open, and use all other means to procure a free ventilation. On the strict observation of this rule the cure will in a great measure depend.

For the next article of prevention I gave a vomit, and after its operation half a drachm of *theriaca* with ten grains of *sal cornu cervi* and some draughts of vinegar-whey; and I repeated the same, without the vomit, the following night. Sometimes I have used the sudorific medicine alone; and by both methods I have seen those symptoms removed, which I apprehended to be the forerunners of this fever received by contagion.

I must not omit to observe, what may appear a minute circumstance, that as the cure depends so much upon a free *diaphoresis*, I found it conducive to that end, especially with the less cleanly sort, to have their feet and hands washed with warm vinegar and water. After sweating, if the patient

patient was to remain in the foul air, I used as a preservative the alexipharmac decoction which I shall treat of afterwards.

II. BUT in the *second state*, when the fever was manifest, if the pulse was full, I generally took away some blood, if that had not been done before. When the symptoms run high, a plentiful evacuation of this kind seems indicated, yet large bleedings have generally proved fatal, by sinking the pulse and bringing on a *delirium*. Nor is a moderate bleeding to be repeated without caution; for as several circumstances in this fever are contradictory to the common rules, so experience shews that even those whose blood is fizy, unless the lungs be inflamed, are the worse for a second bleeding. If the head only suffered I judged it safer to bleed by leeches at the temples, than to open a vein in the arm. But in the *delirium* with a sunk pulse, even leeches did no good, sometimes harm, and therefore phlebotomy was not to be tried. Many recovered without bleeding, but few who lost much blood.

Vomits are also to be used cautiously. Before the disease is formed, one was recommended for prevention; and even if the stomach was foul, as is usual in autumn, an emetic was believed to be proper in the beginning of the second period also, in order to relieve the stomach, and dispose more to a sweat. In autumn 1757, when our troops returned from the expedition to the *Rade de Basque*,

several of the soldiers, were brought into the hospital at Portsmouth, ill of a disorder compounded of the bilious and jail-fever. For when those men, upon being seized with the common fever of the season, were confined to the holds of the crowded ships, their distemper soon put on a malignant form. All those who were not in the low state, but complained much of a headach, of costiveness and a disorder at their stomach, I first bled, then purged; and afterwards, proceeding with them in the manner described in the cure of the bilious-fevers*, I gave them twice a day a grain of emetic tartar, which commonly not only puked, and opened the body, but brought on a *diaphoresis*. All those who were treated in this manner recovered. But in the advanced state of a mere malignant fever, when the patient has all along complained of a sickness at his stomach, I judge emetics to be unsafe, from having seen in two instances the disease take suddenly a worse turn, when in such circumstances I had given a vomit of ipecacuanha. Nor can I recommend any other method as sufficiently ascertained by my experience in this distemper; but in other fevers, which I have treated since, and which by a constant *nausea* shewed some similarity to these, I have frequently been able to conquer that symptom, by giving the saline draughts of *Riverius*†, as usual,

* Page 201 et seq.

† *Huic symptomati (scil. vomitui) gravissimo statim medetur, quasi miraculo, sal ab-
sinthii ad ʒi. in succi limonum recentis cochleari exhibitum, ut experientia didici.* RIVER.
in cap. de Feb. Pestilent. The manner in which this operates may perhaps be deduced

usual, in the act of effervescence, but repeated oftener than what is commonly practised. This is my formula:

*R Salis absinthii ℥iv. sacchari albi ℥ij. solve ex aqua pura ℥iv.
et admisce aquæ cinnamoni simplicis ℥ij.*

*Dentur omni horâ cochlearia iij. cum cochleari uno succi limonum,
donec æger nauseare desierit.*

Previously to this medicine, I have sometimes made the patient clear his stomach by drinking some camomile-tea; at other times, I have omitted that infusion; but, when costive, have always ordered him a clyster.

The next care is to promote a *diaphoresis*, which in this state of the fever is only to be attempted by the milder sudorifics; and for this purpose the *spiritus Mindereri* has been

ced from Append. paper vii. exp. xlv. I find the quantity of a drachm of the salt, in RIVERIUS's draught, marked in two editions of the original, but which must be a typographical error for a scruple, if the author meant that there should be no more salt than was sufficient to saturate the acid, and if the salt which he used was of the same strength with ours. This last circumstance however may be doubted, considering that formerly the *sal absinthii* was frequently prepared with sulphur, and by means of the acid there, it became a much weaker alkali than what is now kept in the shops. In those days recourse was had to this salt in several disorders of the stomach, from a notion that it possessed all the virtues of the original plant; and the acid seems chiefly to have been added to make it more grateful to the stomach. But now we find, that the lixivial salt of every plant will answer as well as that of wormwood, and that the lemon juice, or some other acid, is necessary for producing an effervescence, with an evolution of some fixed air, upon which the virtue of that useful medicine so much depends: see Append. paper vii. exp. xlv.

used

used. But at this time of the disease, the morbid cause is generally too much fixed to be expelled by sweating; and therefore unless a sweat comes easily, and with relief to the patient, it is never to be insisted on; nay, if voluntary and profuse, with a low and quick pulse, it must be checked. Then the fever begins to elude all the force of blisters, alexipharmacs, and sudorifics, until the usual time of its decline. Of this I have seen many instances, but shall mention one only. Mr. *Annesly*, one of the mates, was seized with the hospital fever, and after being confined to his bed, for four or five days, and blistered, he took several doses of musk, of five and twenty grains each, which opened his body, raised his pulse, and brought on a thorough sweat; yet the fever continued till about the seventeenth day, when it went off with a gentle moisture of the skin, and turbid urine.

As soon therefore as the fever was confirmed, I gave such medicines only as were recommended above in the cure of inflammatory fevers*, viz. the contrayerva powders with nitre and camphire, and barley-water acidulated with vinegar.

Although costiveness was prevented by clysters (lest an accumulation of the *feces* should prove a new source of corruption) yet a looseness was not encouraged, on account of the great weakness attending this illness.

* Part iii. ch. i.

About this time I have used blisters, but without success. Nay, upon the first attack, the whole head has been blistered, and the oozing kept up for some days; but without relieving the head, or preventing any of the usual symptoms.

III. I come now to the *third* and longest *state*, in which the pulse *sinks*, the *stupor* is great, a *delirium* is threatened, and *petechie* often appear. This change begins in three or four days after the fever is formed, often later, according to the treatment and other circumstances. But, what is observable, if the patient has been once or twice largely bled, on the first symptoms, he will be apt to pass over the second stage, and from a condition little removed from health, his pulse will be apt to sink, and he suddenly become delirious. Now, whether this was occasioned by misconduct, or by the course of the disease, I found it necessary to vary the method, and to have for my principal intention the support of the *vis vite*, especially towards the decline of the fever; but this could not be answered without some warmer medicines than those which have yet been mentioned. Therefore, as soon as the pulse began to flag, and the urine to turn pale, I left out the nitre in the diaphoretic powders *, and substituted the *Serpentaria*.

* Part iii. ch. i.

Sometimes I have given a plain decoction of that root, adding a small quantity of some spirituous liquor; at other times, I have prescribed the same in substance, from two scruples to a drachm every day, and with good effects; but at last an accident was the occasion of my adding the Bark. A man ill of this fever, with petechial spots, had a blister applied to his back, and the part mortified. But a strong decoction of the Bark, together with some of the tincture being given, and continued for some days, with the usual cordials, the sore began to suppurate, and the case took so favourable a turn, that there was little doubt of the patient's recovery, till nauseating the medicine, he left it off, and then the gangrene recurred, and he died. From this case however I was induced to join the decoction of the Bark with the Snake-root in the advanced and sunk state of the fever. The first nine recovered who took this compound medicine, though four of them had the *petechiæ*; and in thirty nine cases, which were under my care in that season, I lost only four. But it will be just to add, that the places in which the sick lay were uncommonly well aired, and that the fever was not attended with so much malignity as I have seen it at other times. For at *Ipswich*, where the kind was worse, and where the air was so much vitiated in the hospital, that most of the nurses were infected, as well as the men who were admitted for other distempers, I imagine (for I kept no exact account) that I might lose about double that proportion.

When

When I joined the Bark to the *serpentaria* in ordinary cases, I began with a much smaller quantity than what I had used for the gangrene, intending to increase it by degrees; but finding that smaller quantity answer so well, I seldom altered it. This is now my receipt:

R Corticis Peruviani in pulverem contriti ℥iij. coque ex aquæ puræ ℥xvj. ad ℥viiij. adjectis sub finem coctionis radicis serpentariæ Virginianæ ℥ij. stent per horam, et colaturæ admisce aquæ alexiteriæ spirituosæ cum aceto ℥ij. sacchari albi ℥ß.

Of this my common dose was four spoonfuls every six hours; if the patient was heated by it, he took only three; but if he was lower than usual, I gave the same quantity once in four hours, diminishing it, or giving it at longer intervals, according to the circumstances: sometimes I have lessened the proportion of the *serpentaria* when I imagined that it heated too much.

In one case the fever terminated in a suppuration of one of the parotids, which was opened and healed during the use of the same remedy.

Besides this medicine, it was sometimes proper to give a volatile cordial mixture, in this manner:

*R Aquæ puræ ℥vj. aquæ nucis moschatæ ℥j. confectionis cardiacæ ℥iß. salis cornu cervi ℥ß. syrupi croci ℥ß. misce.
Dentur subinde in languoribus cochlearia ij. vel iij.*

This quantity was commonly consumed in 24 hours. But in cases out of the hospital, and where wine was to be had in plenty, I either omitted this cordial, or used it more sparingly. In general, it agreed well with the low state of these fevers; and in great sinkings, which either came after unseasonable bleedings, or long want of nourishment, it was next to wine the best resource. For, as a grateful and efficacious cordial at this time, there was nothing comparable to wine, of which the common men had an allowance from a quarter to half a pint in a day of a strong kind, made into whey, or added to the panada which was their only food. But to others out of the hospital, I commonly prescribed *Rhenish*, or a small *French* wine, whereof some have consumed near a quart a day, and part of that undiluted. And indeed so great is the virtue of wine in this stage of the fever, that I have known many recover from the lowest condition, when refusing the decoction, on account of its taste, they took nothing but a little panada with wine, and the volatile mixture, every two or three hours, by turns. Perhaps there is no rule more necessary, than never to let the patient, when low, remain longer without taking something cordial or nourishing; as I have seen men, once in a promising condition, sunk past recovery, by being allowed to pass a whole night without any support about the time of the *crisis*. Nothing can be lower than the sick are in the advanced state of this fever, and therefore

Hoffman

Hoffman rightly advises, in all such cases, that they may be kept constantly in bed, and not permitted even to sit up in it. In the last stage of this disease, as well as in that of the sea-scurvy, it should seem that the force of the heart is too small to convey the blood to the brain, except when the body is in a horizontal posture *.

But however necessary wine and the decoction above-mentioned are in the low state of the fever, we are to remember, that throughout this long stage these remedies are to be administered only by way of antiseptics, and in order to support the *vis vitæ*, without aiming at thoroughly raising the pulse, or thoroughly relieving the head, or at forcing a sweat by them before nature points that way, which I have seldom seen happen before the fourteenth day. For, though the patient may sometimes die before that period, if he has been too largely bled, or if hot medicines have been given him too freely, yet those remedies which I have hitherto used have not been powerful enough to bring on a *crisis* sooner.

We have seen how inseparable a *stupor* was from this fever, particularly in its low state, and how apt this *stupor* was to turn to a slight *delirium* in the evening. If this was all, as being in the common course, nothing was done. But if I found the *delirium* increase upon using wine, if

* See the description of the sea-scurvy in Lord ANSON's voyage.

the eyes looked wild, or the voice became quick, there was occasion to apprehend a true *phrenitis*, and agreeably to this, I have observed that at such times all internal heating medicines aggravated the symptoms, whilst blisters, before useless, became then of service: in that emergency therefore I began to use them as in the inflammatory fevers. I have had no opportunity of trying, in the *delirium* of these fevers, the fomentations of warm water and vinegar to the feet, which I have since found efficacious in other fevers *; but I am inclined to believe, that in this case also they will answer better than sinapisms or blisters, provided they be long enough and often enough applied. In the inflammatory fevers, I have known these fomentations have little effect for the first hour, and yet succeed afterwards. For internal medicine, I omitted the decoction for some time, but continued the acid †, and gave camphire with the *pulvis contrayervæ compositus* and nitre as before. If the *delirium* was with a slow voice, and without violent motions, the decoction and wine were given, without any other medicine; for in no instance was this symptom quite removed till the usual time of the *crisis*. I have observed that a *delirium* would arise from two opposite errors; one, from large and repeated bleedings; and the other, from wine and the warm cordial medicines given too early. It appears therefore how nice the principles are that regard the cure: thus neither a hot nor a cool

* Part iii. ch. ii. § i.

† Viz. Barley-water with vinegar.

regimen

regimen will answer with every patient, nor with every state of the disease.

If a *diarrhoea* comes on in the decline of the fever, it is to be moderated (but never suppressed) by adding a few drops of the *tinctura Thebaïca* to the full quantity of the alexipharmac decoction; or by giving some spoonfuls of the chalk-julep with opium mentioned before*. For, though the looseness may be considered as critical, yet as the sick are too low to bear great evacuations, it must in some measure be restrained; and I have often observed, that when it has been treated in this manner, about the usual time of the *crisis*, the patient has fallen into a breathing sweat, which has carried off the disease. In the worst kinds of the fever, and especially when it coincides with the dysentery, the stools are frequently bloody; in which dangerous case, if any thing can be done, we must attempt it by the same medicines. In proportion to the putrid nature of the stools, opiates and astringents are to be used with the greater caution.

We shall next consider the state of the patient after the fever has ceased, or changed into another form. If the disease terminates in a suppuration of the parotid glands, one caution only is needful, which is to open the abscess soon, without waiting for a fluctuation, or even a softness

* Page 207. In order to check the purging and promote a *diaphoresis*, I should now prefer a bolus of *theriaca* with *ipécacuanha* likewise mentioned in that page.

of the tumour, which may never happen; the *pus* being here so very viscid, that after it is ripe, the part will feel as hard as if the suppuration had not begun*.

Almost every patient, after the fever, complained of want of rest, frequently of a *vertigo* or confusion of the head, of a continuation of the deafness, or of other symptoms, sometimes the consequence of great lowness, at other times, of some disorder not so easily to be accounted for. I then gave an opiate at night, with medicines of the strengthening kind, such as the Bark, and elixir of vitriol. I have found that the Bark is not only the best strengthener, but the surest preservative against a relapse. For this last intention, it is necessary that the convalescent should take about three drachms a day for six or seven days together; and afterwards, if he remains longer in the hospital, some smaller quantity daily. When the pulse was slow, a few grains of *asa fetida*, given twice a day, have had a good effect. But if there was an appearance of a hectic fever, from an inward abscess, the case was to be treated accordingly. Upon comparing some of the remaining symptoms of those who recovered, with the

* This may be the reason why these tumours have not always proved critical. For RIVERIUS, after the swelling of the glands, was obliged to make other evacuations: perhaps from not making timely incisions: *vid. cap. de Feb. Pestilent.* The late Mr. GIRLE told me, that he had observed that such critical tumours, after malignant fevers, were not to be ripened by poultices of bread and milk, which (by growing cold) are more apt to repel them, but by some of the warm gum-plasters.

condition of the brain in such as died, I have been induced to think that some part even of that substance may suppurate, and yet the person recover.

Sometimes the patient falls into an irregular intermittent, which, if not of a hectic nature from an internal abscess, may proceed from neglecting to clear the *primæ viæ*. For, it is easy to conceive, that after a long fever of a most putrid nature, attended with a *languor* of the bowels, the *feces* may be so much accumulated as to occasion various disorders. In such cases, after proper evacuation, the Bark was almost a sure remedy.

§ 6.

Of the causes of malignant fevers in general.

IT is evident from the preceding account, that this distemper is of a truly malignant or pestilential nature, as appears by the manner in which the head is affected, the dejection of spirits, debility, sunk pulse, the suppuration of the parotid and axillary glands, the putrid sweats, petechial spots, mortifications, and contagion. For, though all these circumstances are not found together in one person, yet they are common to the disease; and it is well known, that in the plague itself, the symptoms are various, according to the degree of virulence, and the constitution of the person infected.

It

It would be unnecessary to shew the difference between a malignant or pestilential fever, and the true plague, as that distinction, not clearly comprehended by the ancients, has been well ascertained by some of the later writers on that subject. And therefore I shall only remark, that though the hospital-fever may differ *in specie* from the true plague, yet it may be accounted of the same *genus*; since it seems to proceed from a similar cause, and is attended with the like symptoms.

The malignant or pestilential fevers are various, according to the virulence of the *miasma* or putrid ferment received into the blood; but all seem to depend upon some internal, or external *fomes* of corruption, whether owing to a putrid habit, or to exhalations from corrupted animal, or vegetable substances. I shall first treat of the *remote* and *external causes*, and next of the *immediate* and *internal*.

I. The hospital and jail-fevers are to be considered as the same disease, and little if at all different from such as have arisen after battles, when the bodies of the slain have been left unburied to rot upon the field. This *Galen* notes as one of the causes of pestilential fevers *, and he is supported by the testimony of other authors, in particular by *Forestus*, who was eye-witness to a distemper of this kind (which indeed he calls a plague) owing to the

* Epit. GALEN. De Feb. Differ. lib. i. cap. iv.

same cause, attended with buboes and a high degree of contagion *. The same author also gives an account of a malignant fever breaking out at *Egmont* in *North-Holland*, occasioned by the rotting of a whale that had been left upon the shore †. We have a like observation of a fever affecting the crew of a *French* ship, upon the putrefaction of some cattle which they had killed in the island of *Nevis*, in the *West-Indies* ‡. These men were seized with a pain in their head and loins, great weakness, and a disorder of the stomach, accompanied with a fever; some had carbuncles; and on others, purple spots appeared after death.

Hippocrates describes a pestilential constitution, and imputes it to a southern, humid and close state of the air §. The putrid *effluvia* of lakes and marshes are mentioned by *Galen* as having the same effect ||.

One of the most memorable distempers incident to an army is recorded by *Diodorus Siculus* ¶, which broke out among the *Carthaginians* in *Sicily*, at the siege of *Syracuse*. That author not only relates some of the most distinguishing symptoms, but reasons well about the cause. He says,

* Observat. lib. vi. obs xxvi.

† Obs. ix. schol. PARAEUS says, that in his time the like happened on the coast of *Tuscany*. *De Peste*. cap. iii.

‡ Traité de la Peste.

§ Epidem. lib. iii. sect. iii.

|| Epit. GALEN. de Feb. Differ. lib. i. cap. iv.

¶ Bibliothec. Hist. lib. xiv. cap. lxx. lxxi.

that pains in the back, and eruptions * were common; that some had bloody stools; and that others were suddenly seized with a *delirium*, so as to run about and beat all that came in their way †; that they died on the fifth, or at furthest on the sixth day; that the physicians knew no cure; and that it was the more fatal as the sick were abandoned by every body on account of the contagion. As to the cause, the historian takes notice of the multitude of people confined within a narrow compass; of the situation of the camp in a low and wet ground; of the scorching heats in the middle of the day, succeeded by the cold and damp air from the marshes in the night-time ‡: he adds, the putrid steams arising first from the marshes, and afterwards from the bodies of those who lay unburied.

I observed, that I had found the first full account of malignant epidemic fevers, attended with *petechiæ*, in *Fracastorius*. One of these appeared in the year 1505, and another three and twenty years after, both in *Italy*. That author omits the cause of the former; but the latter he ascribes to an extraordinary inundation of the *Po*, which happen-

* In the original, *φλύκταιναι*.

† This circumstance of a sudden *delirium* agrees with what was mentioned in the description of the marsh-fever, in the cantonments near *Bois-le-duc*. Part iii. ch. iv. § 2.

‡ This is said to be the principal cause of the malignant camp diseases in *Hungary*: see pages 188, 189.

ing in the spring left marshes, and these corrupting infected the air throughout the summer.

Foreſtus remarks, that from the putrefaction of the water only, the city of *Delft*, where he practiſed, was ſcarce ten years together free from the plague, or ſome peſtilential diſtemper*. In the year 1694, a fever broke out at *Rochfort* in *France*, which, on account of the malignant ſymptoms and great mortality, was at firſt believed to be the true plague †. But M. *Chirac*, who was ſent by the Court to inquire into its nature, found the cauſe to ariſe from ſome marshes that had been made by an inundation of the ſea, and obſerved, that the corrupted ſteam, which ſmelled like gun-powder, were carried to the town by the wind that had blown long from that quarter. About two thirds of thoſe who were taken ill died ‡. This fever raged in June, July and Auguſt, and then ended upon a great fall of rain, which purified the air and reſreſhed the ſtagnating water.

I might adduce many inſtances of malignant fevers, occaſioned by the putrid *effluvia* of marshes, from other

* *Obſervat. lib. vi.* He adds, that the magiſtrates upon his representation of the cauſe, erected a wind-mill for moving and reſreſhing the water. At that time *Holland* was much more liable to inundations, and to the ſtagnation of water than it is at preſent.

† *Traité des Fievres Malignes. Oeuvres Poſthumes de M. CHIRAC. Eloge de M. CHIRAC par M. de FONTENELLE.*

‡ In thoſe who were opened, the brain was found either inflamed, or loaded with blood; the fibres of the body were remarkably tender; and the bowels were either ſuppurated or mortified.

authors ; but as those already mentioned are sufficient to prove what has been advanced, I shall observe upon the whole, that the bilious or remitting and intermitting fevers of low and wet countries, when at the worst, may be considered as *species* of the malignant or pestilential fever, since they have been seen with all the virulent symptoms peculiar to that class of diseases *.

In general it may be remarked, that the putrefaction of animal or vegetable substances, in a dry air, is most apt to produce a malignant fever of a more continued form ; whereas putrid *effluvia*, in a moist atmosphere, have a greater tendency to bring on paroxysms and remissions. But the steams of corrupted blood dispose more to a flux than to any other disorder ; for, though some will be seized with the hospital-fever by the contagion of bloody stools, yet I have observed that for the most part this infection produces the dysentery †.

From this view of the causes of malignant fevers and fluxes, it is easy to conceive how incident they must be, not only to all marshy countries after hot seasons, but to all populous cities, low and ill aired ; unprovided with common sewers ; or where the streets are narrow and foul ; or the houses dirty ; where fresh water is scarce ; where jails, or hospitals are crowded, and not

* Part iii. ch. iv. § 2, 3.

† Part iii. ch. vi. § 3.

ventilated or kept clean; when in sickly times, the burials are within the towns*, and the bodies not laid deep; when slaughter-houses are within the walls; or when dead animals and offals are left to rot in the kennels, or on dunghills; when drains are not provided to carry off any large body of stagnating or corrupted water in the neighbourhood; when flesh meats make the greatest part of the diet, without a proper mixture of bread, greens, wine or other fermented liquors; when the grain is old and mouldy, or has been damaged by a wet season; or when the fibres are relaxed by immoderate warm bathing. I say, in proportion to the number of these or the like causes concurring, a city will be more or less subject to pestilential diseases, or to receive the leaven of a true plague, when brought into it by any merchandize. I shall add a few instances to confirm these observations.

Constantinople is not only liable to frequent returns of the true plague, but to an annual pestilential fever which may be considered as the endemic distemper of the place†. But, that this is not owing to the climate, appears from its healthful state during the *Greek* empire, and from observing that, even now, such as live in the suburbs and keep out of the way of infection are secure. Nor is the cause to be referred only to the crowds, and to the narrowness

* SCRETA De Feb. Castren. Malign.

† See TIMONI's account of the plague at *Constantinople* in *Phil. Trans.* N. 364; Abridg. Vol. vi. part iii. ch. ii. sect. xxi.

and nastiness of the streets, since some of the foreigners are less subject to the sickness than the *Turks* themselves *. It must therefore be attributed to something peculiar to that people, or rather to such as profess their religion. For, besides that pestilential distempers are frequent in all the cities of the *Levant*, they prevail greatly in *Egypt* †; where the inundations are not solely to be blamed, as that country was more healthful before it became a province of the *Ottoman* empire. And in *Sennar*, where Mahometanism is likewise established, pestilential fevers make great ravages, though they but seldom visit the *Abyssinians*, who border on that kingdom, and live in a hotter climate, but are Christians ‡. Now, for this difference the following causes may be assigned. The religion of the *Turks* enjoins constant ablutions; and it is well known that warm bathing, by relaxing the fibres, disposes the body to putrid diseases §. Add to this, their abstinence from wine and all fermented liquors, the great antidotes to putrefaction ||; the

* Although TIMONI observes that strangers in general run a greater hazard than the citizens, yet he adds, ‘*Armeni omnium nationum minimè ad pestem sunt dispositi: observo illos paucissimis uti carnibus: cepis, porris, alliis, vinoque maxime utuntur.*’

† Vid. PROSPER ALPIN. de Med. Egypt.

‡ Lettres Edifiantes et Curieuses, recueil iv.

§ Therefore CELSUS forbids bathing in time of the *pestilentia*; that is, as was shewn before, during the season in which malignant or pestilential fevers prevail. *De Med. lib. i. cap. x.*

|| We have the following singular observation in FORESTUS, on occasion of a pestilential fever that raged in his time: ‘*Quincunque aquam ob ingentem calorem febrilem*

the principle of fatalism, which keeps them from avoiding infection; and their ignorance of the learned arts, by which they might know to prevent or cure such diseases.

In the account of the epidemic malignant fever of *Cork* in *Ireland*, we find the cause ascribed by the author to a concurrence of these circumstances; the moisture of the air, the impurity of the water, the infection of an uncommon number of slaughter-houses, and the offals left to corrupt in the streets, joined to the immoderate quantity of flesh-meats eaten by the poorer people, without bread or fermented liquors, during the victualling season*.

Forestus informs us of a pestilential fever which raged at *Venice* in his time, produced by the corruption of a small kind of fish in that part of the *Adriatic* †. And the same author quotes *Montanus* for a description of the pestilential endemic fever at *Famagusta* in *Cyprus*, arising in summer from the corruption of a lake in the neighbourhood.

*'febrilem bibissent (ut villicus quidam, ad quem curandum alio morbo affectum, ac-
' citus esset, mihi narravit) correpti intra duos dies moriebantur. Qui vero cere-
' viciam bibebant, utpote potum magis huic nostræ regioni consuetum, iis morbus
' protrahabatur.'* Dr. ROGERS observes, "that such as riot on animal food,
" and drink water only, are subject to putrid and slow fevers."

* See Dr. ROGERS's Essay on Epidemic Diseases. In this book we have a full account of the rise of a malignant fever, and small-pox, deduced from a putrefaction in the air, peculiar to the city of *Cork*, from August to January. That place is noted for the great number of cattle killed for the use of the shipping, which is said to amount to above 120,000 head in the year.

† Observat. lib. vi. obs. ix. schol.

This

This very distemper we find taken notice of by *Fracaſtorius*, and allowed to be the ſame with what he calls the *lenticulæ* or *puncticula*, ſince known by the name of the petechial fever.

Hiſtory abounds with examples of peſtilential fevers added to the other miſeries of a ſiege: nay, there is ſcarce any inſtance of a town being long inveſted, without ſome diſtemper of this kind. Sometimes it may be owing to the filth of a place crouded with people and cattle brought in for ſhelter, as it formerly happened both at *Athens** and at *Rome*†; at other times, the ſickneſs has been occaſioned by corrupted grain‡, and by meats long ſalted becoming putrid.

Although the putrefaction of vegetables is not ſo noxious as that of animals, it is not however without bad effects; for vegetables rotting in a cloſe place yield a cadaverous ſmell; and we have inſtances of malignant fevers occaſioned by the *effluvia* of putrid cabbages§, as well as of plants in marſhes. *Foreſtus* imputes the plague at *Delft*, in the year 1557, to the eating of mouldy grain, which had been long kept up by the merchants in a time of ſcarcity||. And I have heard it remarked, that in this

* DIODOR. SICUL. Bibliothec. Hiſt. lib. xii. cap. xlv.

† TIT. LIV. anno U. C. 291.

‡ CÆSAR *De Bell. Civ. lib. ii.* in his account of the ſiege of *Marſeilles*.

§ DR. ROGERS'S Eſſay on Epidemic Diſeaſes, page 41.

|| Obſervat. lib. vi. obſ. ix.

island the dysentery is observed to be most frequent among the common people in those parts where they live wholly on grain, when the preceding crop has been damaged in a rainy season, or kept in damp granaries.

Jails have been often the cause of malignant fevers; and perhaps no where oftener than in this country. Lord Bacon makes the following observation: "The most pernicious infection, next the plague, is the smell of the jail, when the prisoners have been long, and close, and nastily kept; whereof we have had, in our time, experience twice or thrice, when both the judges that sat upon the jail *, and numbers of those who attended the business, or were present, sickened upon it and died. Therefore it were good wisdom, that in such cases the jail were aired before they be brought forth †." It is probable that one of the times, pointed at by this noble author, was at the fatal assizes held in the year 1577, of which we have a more particular account in *Stowe's Chronicle*, in these words: "On the 4th, 5th and 6th days of July were the assizes held at Oxon, where was arraigned and condemned *Rowland Jenkins* for a seditious tongue; at which time there arose amidst the people such a damp ‡, that almost all were smothered. Very few escaped that were not taken....Here died

* That is, upon the prisoners from the jail.

† Natural History, exp. 914.

‡ A damp; an old expression (still retained by the miners) signifying *bad air*.

“ in *Oxon* three hundred persons; and sickened there, but
 “ died in other places, two hundred and odd *.

Of the same kind of infection we have an unhappy instance so fresh in our memory that I need not have mentioned it here, had it not been to inform such as live at a distance, or those who are to come after us. In the year 1750, on the 11th of May, the sessions began at the *Old Baily*, and continued for some days; in which time there were more criminals tried, and a greater multitude was present in the court than usual. The hall in the *Old Baily* is a room of only about thirty feet square. Now, whether the air was at first tainted from the bar by some of the prisoners then ill of the jail-distemper, or by the general uncleanness of such persons, is uncertain †; but however that might have been, it will be easy to account for its corruption, especially as it was so much vitiated by the foul steams of the *Bail-dock*, and of the two rooms opening into the court, in which the prisoners were the whole day crowded together till they were brought out to be tried ‡.

* This account is confirmed by CAMDEN: *vid. Annal. Eliz.*

† It has been the custom, some days before every sessions, to remove all the malefactors from the other jails into *Newgate* already too much crowded. At such times three hundred have been confined within that narrow space; and it is well known how nastily both this and all the other prisons are kept.

‡ I have been informed, that at those sessions about a hundred were tried, who were all kept in those close places as long as the court sat; and that each room was but 14 feet by 11, and seven feet high. The *Bail-dock* is also a small room taken off one of the corners of the court, and left open at the top: in this, during the trials, are put some of the malefactors who have been under the closest confinement.

It

It appeared afterwards that those places had not been cleaned for some years. The poisonous quality of the air was still aggravated by the heat and closeness of the court, and by the perspirable matter of a great number of people of all sorts, penned up for most part of the day without breathing the free air, or receiving any refreshment. The bench consisted of six persons *, whereof four died, together with two or three of the council, one of the under-sheriffs, several of the *Middlesex*-jury, and others present, to the amount of above forty; without making allowance for those of a lower rank, whose death may not have been

* *Viz.* the Lord Mayor, three of the Judges, one of the Aldermen, and the Recorder. Of these died Sir SAMUEL PENNANT, Lord Mayor; Sir THOMAS ABNEY and Baron CLARKE, Judges; and Sir DANIEL LAMBERT, Alderman. It is remarkable, that the Lord Chief Justice and the Recorder, who sat on the Lord Mayor's right hand, escaped, whilst he himself, with the rest of the bench on his left, were seized with the infection; that the *Middlesex*-jury, on the left side of the court, lost many, whilst the *London*-jury, opposite to them, received no harm; and that of the whole multitude, but one or two, or, at most, a small number of those who were on the Lord Mayor's right hand, were taken ill. Some, unacquainted with the dangerous nature of putrid *effluvia*, have ascribed both this circumstance, and the sickness in general, to a cold taken by opening a window; by which a stream of air was directed to the side of the court on the Lord Mayor's left hand. But it is to be observed, that the window was at the furthest end of the room from the bench, though the judges suffered most. Nor could the kind of the fever, or the mortality attending it, be attributed to a cold: it is therefore probable that the air from the window directed the putrid streams to that part of the court abovementioned. This indeed must be granted, that all septic particles, passing into the blood, become more active and fatal if the infected person catches cold, or by any accident suffers a stoppage of perspiration: for, a free perspiration seems to be the chief means by which the blood is purified from any infectious matter.

heard of; and without including any that did not sicken within a fortnight after the feffions.

It was said, that this fever in the beginning had an inflammatory appearance, but that after large evacuations the pulse sunk*, and was not to be raised by blisters, or cordials; and that the patients soon became delirious. Several had the *petechiæ*; and all that were seized with the fever died, excepting two or three at most. Some escaped without a fever by a looseness coming on, which was easily cured. This sickness, as far as was known, spread no further; there being at that time no disposition in the air, nor other circumstances, to propagate the infection.

By Dr. *Huxham's* observations, we find that the same malignant fever has been frequent at *Plymouth* during the former war, occasioned by the number of *French* prisoners, and by the hospitals and other places being crowded with men taken out of our own ships actually ill of this distemper †.

It is remarkable how much the plague, pestilential fevers, putrid scurvies, and dysenteries have abated in *Europe* within this last century; a blessing which we can ascribe to no other second cause than to our improvement

* See page 291.

† Essay on Fevers, ch. v. viii.

in every thing relating to cleanliness, and to the more general use of antiseptics. *Felix Platerus*, physician at *Basil* in *Switzerland*, gives an account of seven different pestilential fevers (he calls each *pestis*) which afflicted that city in the space of seventy years, all of them within his memory*. *Thomas Bartholine* mentions five that raged in *Denmark* in his time, and all from some foreign contagion†. And other authors their contemporaries, throughout *Europe*, are full of the like observations. *Forestus* remarks, that in his days the plague was most frequent at *Cologne* and *Paris*, and refers the cause to the multitude of the inhabitants, and the nastiness of the streets‡; yet at present both those cities are in general healthful, and not peculiarly subject to any putrid disease. *Timoni* takes notice, that at *Constantinople* the cleaner houses are less liable to be infected with the plague than the dirty§.

As to diet, it may be observed, that hopped beer, wine and vinous liquors coming more into general use, have

* F. PLATER *Observat. lib. ii.*

† *Nostrâ memoriâ quinques in Daniâ pestilentia grassata est, 1619, 1625, 1629, 1637, 1654, semper aliunde translata: THO. BARTHOL. De Medicin. Danor. Domest. dissert. iv.*

‡ *Coloniæ, et Lutetiæ Parisiorum, pestis frequentissima est ob hominum frequentiam & sorditiem platearum. Observat. lib. vi. obs. v. schol.* At that time, the streets not being paved, we may easily conceive how offensive they must have been in such large and populous cities. It will be proper to observe, that *FORESTUS* generally confounds the true plague with pestilential or malignant fevers, and therefore it is probable that he only means the latter; since those two cities were the least liable to the true plague, from their inland situation.

§ *Philos. Transact. n. 364. Abridg. vol. vi. part iii. ch. ii. sect. xxi.*

been

been some means of suppressing putrid diseases. Greens and fruit are likewise more universally eaten *, and salted meats make a much less part of our diet than formerly. To this add the more general consumption of tea and sugar, which I have shewn elsewhere to be no inconsiderable antiseptics †. How far these things may be abused, or become productive of other distempers, is not now the question.

For so great a city, perhaps *London* at present is one of the least subject to malignant fevers, to the dysentery, or other

* Having asked Mr. MILLER, keeper of the botanic garden at *Chelsea*, what he thought might be the proportion between the quantity of greens and fruit consumed now, and an hundred years ago, he told me, “ That in former times, he believed, “ the tradesmen and common people, about this city, scarce used any, and those “ of higher rank, very little. For, that he had been assured by old gardeners, and by “ others of his acquaintance, that so late as seventy years ago, a cabbage sold at three- “ pence, which now sells for a half-penny; and that most other greens and fruit “ were proportionally dear; insomuch that those, who now eat garden-vegetables “ every day, would then only use them on Sundays, by way of dainty. From “ which circumstance, and the present extent of ground laid out in kitchen-gar- “ dens, he inferred, that there was at least six times more garden-stuff used now “ than about the time of the Revolution.” Nor are we to think that this defect of greens and fruit was supplied by a greater consumption of the *farinacea* in bread, or in other forms; since at that time bread was dearer in proportion to meat than it is now. Hence it seems reasonable to conclude, that formerly a greater quantity of flesh was eaten than at present; and it is well known how much more salted meats were then in common use. Let me add, with regard to the *farinacea*, that they do not seem so much disposed to resist putrefaction as greens or fruit; as appears by the cure of the sea scurvy, and from some experiments that have been made on that subject: see Append. paper iii. exp. xx. xxi.

† Append. paper iv. exp. xxvi.

putrid

putrid disorders ; with all which it seems formerly to have been infested little less than others, notwithstanding the natural advantages of its situation, viz. in a climate not liable to great heats, or close weather, on a gravelly soil, and on the banks of a large river, which not only supplies fresh water, but fresh air, by the constant motion of the tides. Add, that *London* stands in a wide plain, where the fields are kept pretty open. Even since the days of *Sydenham* there appears to be a considerable alteration for the better ; for, besides that there has been no plague, we have known no malignant epidemic fever, or very fatal dysentery*, and few bilious fevers of a bad kind ; or indeed, excepting the small-pox and measles, any putrid distemper that could be called general. In some of the lowest, moistest and closest parts of the town, and amongst the poorer people, spotted fevers and dysenteries are still to be seen ; but which are seldom heard of amongst those of better rank living in more airy situations. Although many things relating to these matters might be better regulated, yet some of the main points are already attended to ; such as regard the privies, the common sewers, the supplies of fresh water ; and the people in general are very cleanly.

The common dirt of the streets does not seem to affect the health of the inhabitants of great cities ; and though

* In autumn 1762, the dysentery though frequent could not be called epidemic. It prevailed chiefly among the lower people, and in general was of a benign kind ; see page 251, 252.

the

the more offensive kind of it may concur with other things to render the air less healthful, yet it seems to have no direct influence in producing pestilential diseases. Stale urine abounds with a volatile alkaline salt resisting putrefaction*; and the common *feces* are rendered less, if at all infectious, by means of a strong acid combined with the parts which are really putrid†. The case is different in putrid disorders, and especially in the dysentery, where the *feces*, as we have already shewn, are wholly corrupted, and contagious‡.

I shall conclude this part of my subject with observing, that whilst great cities furnish many materials for vitiating the air, they are provided with two considerable antidotes; the first arises from the circulation of the air, by means of the constant motion of the people and carriages, and of the draughts made by fires; the other depends on the great quantity of an acid produced by fuel, the strongest resister of putrefaction.

II. Thus far the *remote* and *external causes* of the hospital and other malignant fevers seem to be sufficiently ascertained. But in what manner these causes act, and produce the

* Append. paper i. exp. ii. iii.

† Append. paper vii. exp. xliii. Add the experiments of M. HOMBERG *sur la matiere fecale. Hist. de l'Acad. R. de Sciences, A. 1711.* HOFFMAN *Med. Rat. Syst. tom. i. lib. i. sect. ii. cap. vii.*

‡ Part i. ch. iii. Part ii. ch. ii. § 3. Part iii. ch. vi. § 1.

various symptoms within the body is not so easily determined, and therefore what follows is to be considered merely as a conjecture.

I conceive that the *miasma* or septic ferment (consisting of the *effluvia* from putrid substances) being received into the blood, has a power of corrupting the whole mass *. The resolution of the blood, and sometimes even its smell in the advanced state of a malignant fever, the offensiveness of the sweats and other excretions, the livid spots, blotches, and mortifications incident to this distemper seem to be proofs of what is here advanced. By its acrimony the nerves are affected with various spasms; the pulse is quickened, at first raised, but soon depressed when the heart is not supplied with the vital principle, or from a resolution of its fibres occasioned by putrefaction. I have elsewhere produced instances of the heart being so far relaxed, in a real pestilence, as to become uncommonly large by the ordinary force of the blood †.

Yet, were putrefaction the only change made in the body by contagion, it would be easy to cure such fevers, at any period, by the use of acids, or other antiseptics. But as the disease, when once it is formed, is not to be removed by any such means, it would therefore seem

* See the Append. paper vii. exp. xlviii.

† Append. paper vii. exp. xlvi.

that the brain is inflamed early, and that the fever is chiefly kept up by that inflammation*; that to this circumstance most of the symptoms are owing; and that in the advanced state a cure cannot be expected till the obstructing matter is resolved, or suppurated.

This last part is rendered more probable, by observing some affinity between the symptoms of this fever, and those of the *low* and *nervous* kind, which carry strong marks of an inflammation of some part of the brain, though the immediate cause has not been from putrefaction. The sinking of the pulse, the pale urine, sweats not critical, confusion of the head, decay of strength, dejection of spirits, and *tremor* of the muscles are common to both: and therefore, considering the appearance of the brain in those who died of the hospital-fever, it seems reasonable to conclude, that these symptoms immediately depend upon the inflammation, or the suppuration of that organ.

Another argument may be drawn from the cure. Thus, before the inflammation is fixed, the septic particles may be expelled by sweating; after that period, the most effectual method is to support the strength, but so as not to increase the inflammation. Near the end of the last stage of the disease, the humours being resolved by putrefaction, the obstruction is thereby removed; at which time

* See the dissections.

the strongest antiseptic and cordial medicines have place, in order to correct, and to enable nature to expel what is so much vitiated. In this low state the volatiles are sometimes useful for raising the pulse; wine is a constant cordial; and not only wine, but camphire, *serpentaria*, and the Bark are endowed with considerable antiseptic qualities*.

These are all the remarks which I have made on the nature and causes of malignant fevers. In the description, I have endeavoured to distinguish them from all others, as far as can be done in distempers whose symptoms are so much alike. The nervous fevers are frequently accompanied with miliary eruptions, which have no resemblance to the *petechie*; nor have I ever happened to see miliary eruptions in this malignant kind. The nervous fevers seem to belong to the inflammatory and to the bilious classes of diseases, though incident to such chiefly as are of a weak or lax habit. But whatever gives the first rise to them, if they end in petechial spots, putrid sweats, or become contagious, we may from thence conclude, that by the long continuance of the fever the humours are become putrid; or, in other words, that the nervous fever is changed into one of a malignant form akin to that of hospitals and jails.

* Append. paper ii. exp. xi. xii. xiii.

C H A P. VIII.

Observations on the itch.

IN the division of the diseases most incident to an army, this was the last mentioned. Although it be of a contagious nature, the infection is communicated only by the contact of the diseased person, of his clothes, bedding, &c. and not by *effluvia*, as in the dysentery and hospital-fever. It is confined to the skin, and seems best accounted for by *Leeuwenhoek*, from certain small insects which he discovered in the pustules by the microscope *. So that the frequency of the itch in the army is not to be ascribed to the change of air, or diet, that soldiers are exposed to upon expeditions, but to the infection propagated by a few (who happen to have it at first setting out) to others in the same ship, tent, or barrack †. But of all places the hospitals are most liable to this contagion, as receiving all sorts of patients. Hence I have observed, that after the *crisis* of fevers the itch generally appeared, though the person was free from it when admitted.

* Since the first edition was published, I have seen a paper in the *Phil. Transact.* for the year 1730, called, ‘An abstract of a letter from DR. BONOMO to Signior REDI, containing some observations concerning the worms of human bodies, by DR. RICHARD MEAD.’ By which account, I find that DR. BONOMO was the first who discovered these *animalcula*, and likewise who proposed curing the itch by external applications only.

† Part i. ch. ii.

One therefore unacquainted with this disorder might be apt to mistake it for a miliary eruption, especially as these two bear a nearer resemblance to each other, than could be expected in two ailments of so different a nature. But those who know how seldom the miliary eruptions, and how frequently the other are seen in the army, will be less liable to fall into this error. The two may also be distinguished by the following marks: the miliary pustules, though not confined to the neck and breast, yet are most numerous and visible there; whilst the other infect mostly the parts between the fingers, the inside of the wrists, the sides of the belly, and the hams. The miliary eruption appears before the fever has ceased; they are attended with little itching, and go off of themselves; whereas the itch is not perceived till after the *crisis*, in the convalescent state, when it increases daily and becomes very troublesome.

Although an army cannot be intirely freed from the itch, yet the cure of each individual is more certain in this than in most other distempers; and the remedy is so well known that I scarce need mention it. But I have seen the common method oftener fail with the officers than with the private men; because the latter having no change of dress, what they wore was purified at the same time that they themselves were cured; whilst an officer catching the itch, has run a hazard of keeping it longer;
from

from the circulation of infection between his body and his clothes.

Sulphur is the specific remedy of this distemper, and is both more safe and more efficacious than mercury. For, unless a mercurial ointment touches every part of the skin, there can be no dependance upon it; whereas by a sulphurous application, a cure may be obtained by partial unctions only. It would seem as if these, as well as other infects, were killed by the steams of brimstone, though only raised by the heat of the body. And as to the internal use of mercury, which some have accounted specific, we have known several instances, in the hospital, of men undergoing a complete salivation for the cure of the *lues venerea* without being cured of the itch. The ointment which I mostly used was made in this manner:

℞ Florum sulphuris ʒj. salis Ammoniaci crudi ʒj. axungia porcine ʒij. misce.

This quantity served for four unctions; and the patient was rubbed every night. But to prevent any disorder that might arise from stopping too many pores at once, only a fourth part of the body was anointed at a time. Some are said to cure this disease by rubbing the legs only; but that method I never tried, believing it necessary that the whole skin should be touched.

Although

Although the itch may be thus removed by one pot of ointment, yet it will be proper to renew the application, and to rub the parts most affected for some nights longer, till a second or third quantity is also exhausted. In some bad cases we are obliged to continue to anoint the whole body for several nights together, and also to subjoin the internal use of sulphur; not with a view to purify the blood, but to diffuse the steams more certainly through the skin; as the *animalcula* may sometimes lie too deep to be thoroughly destroyed by a mere external application.

As these fumes may heat the blood at a time when the perspiration is so much impeded, it is proper that the patient should live all the while on a cool diet, and guard against cold. If he is of a full habit, or in any degree feverish, he should bleed and take a purge; otherwise neither of these two evacuations seem to be necessary.

The nature of the itch has been often mistaken, whilst some have referred it to the leprous, and others to the scorbutic class of diseases; whereas it appears to be a distemper *sui generis*, or at least very different from either of those two. The *psora* of the Greek writers, and the *scabies* of the Latin, have been generally supposed to be this very eruption; but as this is not evident from the description which they give of them*, I should conclude, that

* PAULUS ÆGIN. lib. iv. cap. ii. CELSUS lib. v. cap. xxviii.

though

though other diseases of the skin seem to have been formerly no less frequent than at present, yet the itch was either altogether unknown, or at least uncommon among the ancients; since they take such particular notice of other cutaneous foulnesses, and wholly omit this.

Further, it may be observed, that in the most marshy parts of the *Low-Countries*, where the true scurvy is so general and bad, the itch is scarce known; and that though both the scurvy and the itch may meet on board our ships, yet they are to be considered as two distinct ailments; the former arising from foul air, bad water, corrupted provisions, and the want of vegetables; the other, from contagion; each requiring a different cure.

Both the *scabies* and the various kinds of the *impetigo** of the ancients seem at present to be confounded under the general, but improper appellation of *scorbutic eruptions* †. The former are chiefly distinguished by the hardness of the skin in one or more parts of the body,

* It would seem, that by the *impetigo* CELSUS means the *lepra Græcorum*. Vid. *loc. cit.*

† The true scorbutic spots are of a livid colour, not commonly scurfy, or raised above the skin; and are attended with manifest signs of a lax state of the fibres and a corruption of the blood. For, a real scurvy imports a slow, but general resolution or putrefaction of the whole frame; whereas the *scabies*, *impetigo* or leprosy may be found to affect those of a very different constitution.

attended

attended with a dry scurf, or pustules, or scabs ; and always with some degree of itching. But they are so far from being always cureable by external applications only, that it is sometimes dangerous to attempt to subdue them in that manner. Here it is thought necessary to change the humours by a spare diet, frequent purges of the saline kind, or by mercurial or other medicines, which have little or no efficacy in curing the itch, and which rather increase than cure the true scurvy.



9 DE 63



A P P E N D I X,

CONTAINING

I. Experiments upon Septic and Antiseptic Substances,
with Remarks relating to their Use in the Theory of
Medicine, in several Papers read before the ROYAL
SOCIETY.

A N D

II. An Answer to Professor DE HAËN and M. GABER, con-
cerning some Remarks made by them on the preceding
Work.



Δόξα μὲν ἀνθρώποις καὶ μέγα, Πεῖρα δ' ἄριστον.

THEOGNID. *Sentent.*



A P P E N D I X,

P A P E R I.

Experiments shewing that putrid substances are not to be called alkaline; that neither the volatile nor fixed alkaline salts tend naturally to promote putrefaction within the body, being of themselves antiseptic. That the combination of two antiseptics may produce a third weaker than either. Experiments upon the comparative powers of some neutral salts in resisting putrefaction. And of the strong antiseptic qualities of myrrh, camphire, snake-root, camomile-flowers, and the Peruvian bark.

Read June 28,
1759,

ALTHOUGH an inquiry into the manner how bodies are resolved by putrefaction, with the means of accelerating, or preventing that process, has been reckoned not only curious but useful *, yet we find it little prosecuted in an experimental way: nor is it to be wondered at, considering how offensive such

* Lord BACON calls the inducing or accelerating putrefaction: "a subject of very universal inquiry;" and says, "that it is of excellent use to inquire into the means of preventing or staying putrefaction; which makes a great part of physic and surgery. Nat. Hist. cent. iv.

operations are. But as I have been led to make some experiments and remarks on this subject, by my having had an uncommon number of putrid distempers under my care in the hospitals of the army, I shall venture to lay before the Society what I have found different from the common opinion; as well as some facts, which, as far as I know, have not been mentioned before.

FINDING it a received notion, that bodies by putrefaction become highly alkaline, I made the following experiments to enquire how far this may be true.

EXPERIMENT I.

THE *serum* of human blood putrefied made, with a solution of the corrosive sublimate, first a turbid mixture, and afterwards a precipitation. This is one of the tests of an alkali, but scarce to be admitted here; since the same thing was done with recent the urine of a person in health, which is never accounted alkaline. The same *serum* did not tinge the syrup of violets green, and made no effervescence when the spirit of vitriol was poured upon it. I made the experiment twice upon portions of a different *serum*, both highly putrid; and once on water in which corrupted flesh had been sometime infused; and the most I could find was, that having previously given the syrup a reddish cast with an acid, this colour was

was rendered fainter (which might be the effect of dilution) but was not destroyed by the putrid humours. And as to effervescence, having dropped the spirit of vitriol into those liquors unmixed, and also diluted with water, the mixture was quiet, and only a few air-bubbles appeared on shaking the glasses. Upon the whole, though there were some marks of a latent alkali in the putrid *serum*, yet they were so very faint, that a quantity of water equal to that of the putrid liquors, mixed with only one drop of the spirit of hartshorn, being put to the same trial, shewed more of an alkaline nature*.

EXPERIMENT II.

It has been a maxim, that all animal substances being distilled after putrefaction send forth a great quantity of volatile salt in the first water; but Mr. Boyle found that this held good in urine only, and that in the distillation of the *serum* of human blood putrefied, the liquor which came first over had little strength, either as to its smell or taste, and did not at first effervesce with an acid†. And here it may be observed, that the chemists have generally applied those properties which they discovered in urine to all the humours indifferently, whereas, in fact, there

* My conclusion from this experiment is too general, as will appear by a remark made by M. GABER: see An Answer &c. at the end of the Appendix.

† Nat. Hist. of the Human Blood, vol. iv. page 178. fol.

is a great diversity. For, some animal substances, such as the urine, the bile, and the *crassamentum* of the blood soon putrefy; the *serum*, the *saliva*, and the white of an egg, slowly. Yet those that soonest corrupt do not always arrive at the highest degree of putrefaction. Thus the bile is soon corruptible, but the rankness of it is not to be compared to that of flesh; and the white of an egg is not only much less disposed to putrefy than the yolk, but when corrupted yields a different and less offensive smell; and it seems peculiar to stale urine to contain an alkaline salt, which, without distillation, makes a strong effervescence with acids; whereas most other animal humours putrefied, though of a more intolerable *fætor*, contain less volatile salt, less extricable, and scarce effervescing with acids. But what makes the difference between stale urine and other putrid substances still greater, is its inoffensiveness with regard to health; whilst the steams of most other corrupted bodies are often the cause of putrid and malignant diseases.

Now, upon finding in urine a much greater quantity of volatile salt, and that more easily separable than in any other humour; and that stale urine is the least noxious of putrid animal substances; so far from dreading the volatile alkali as the deleterious part of corrupted bodies, from this instance we may rather infer it to be a sort of corrector of putrefaction.

EXPERIMENT III.

DAILY experience shews how harmless the volatiles are, whether smelled to, or taken in substance; but still there remains a prejudice, as if those salts, being the produce of corruption, should therefore hasten putrefaction, not only in distempers where they are unwarily given, but also in experiments out of the body.

As to the effects arising from the internal use of them little can be said, unless the kind of the disorder were precisely stated. For, supposing they were by their nature disposed to promote putrefaction, yet if that is already begun, from a languid circulation and obstruction, the volatiles may then, by their stimulating and aperient qualities, be the means of stopping its progress. And on the other hand, though they were really antiseptic, yet if the humours are disposed to corruption, from excess of heat or motion, these very salts, by adding to the cause, may augment the disease. So that upon the whole it will be the fairest *criterion* of the nature of these volatiles, to inquire whether, out of the body, they accelerate, or retard putrefaction.

1. In order to decide this question, I made repeated experiments of joining both the spirit, and the salt of hartshorn to various animal substances, and I constantly

Z z

found,

found, that so far from promoting putrefaction they evidently prevented it, and that with a power proportioned to their quantity *. The trials were made with the *serum* of the blood, and also with the *crassamentum* after it had been dried by keeping. I once separated the thick inflammatory crust of pleuritic blood from the rest of the mass, and having divided it, I put one portion into distilled vinegar, the other into the spirit of hartshorn; and after keeping the infusions above a month, in the middle of summer, I found the piece which lay in the alkaline spirit as found as that in the acid.

2. Another time, I put into a four-ounce phial about an ounce and an half of an equal mixture of ox's gall and water, with 100 drops of spirit of hartshorn; and in another, as much of the gall and water, without any spirit. The phials being corked were set by a fire, so as to receive about the degree of animal heat, and in less than two days, the mixture without the spirit became putrid; yet the other was not only then, but after two days longer, untainted.

3. I afterwards infused two drachms of the lean of beef in two ounces of water, adding half a drachm of the salt of hartshorn; another phial contained as much flesh

* Mr. BOYLE had already observed, that fine urinous spirits added to blood warm from the vein, would make it appear more florid, keep it more fluid, and long preserve it from putrefaction. Phil. Transact. n. 29. Abridg. vol. iii. ch. v. § viii. and

and water, with a double quantity of sea-salt; in a third there was only the flesh and the water by way of standard: these phials were placed in a lamp furnace, in a heat varying between 94 and 100 degrees of *Fahrenheit's* scale. About eighteen hours after infusion, the contents of the phial, which served as a standard, were rank; and in a few hours more, that with the sea-salt was also putrid; but the flesh with the volatile alkali was sound, and so continued after standing four and twenty hours longer, in the same degree of heat. And that the smell of the hartshorn might occasion no deception, the piece of flesh was washed from the salt, and still smelled sweet.

4. About the same time I took three pieces of fresh beef, of the same weight as above mentioned, and laying two of them in gally-pots, I covered one with saw-dust, and the other with bran; but the third piece being strewed with salt of hartshorn powdered, I put into a four-ounce phial which had a glass stopper. They were all three placed on the outside of a window exposed to the sun, and the weather being warm, the flesh in the gally-pots began to smell on the third day, and on the fourth was quite putrid. Next day, the phial was examined, when the flesh was washed from the salt, and found quite sweet. It was then dried and salted again with hartshorn; and having stood in the house for some weeks, in hot weather, it was inspected a second time, and found to be as sound as before. Nor was the substance at all dissolved, but of such a con-

sistence as might be expected from its having lain in common brine *. And lest it should be suspected that the flesh in the gally-pots, by being more exposed to the air than that in the phial, became sooner putrid, I also inclosed flesh in phials, like that with the salt of hartshorn, and found the confinement rather hasten the putrefaction.

Now, by these and many other experiments of the same kind, finding that volatile alkaline salts not only do not dispose animal substances to putrefaction, out of the body, but even prevent it, and that more powerfully than common sea-salt, we may presume that the same, taken by way of medicine, will *ceteris paribus* prove antiseptic; at least, we cannot justly suppose them corrupters of the humours, more than wine or spirits, which taken in immoderate quantities may raise a fever, and thereby accidentally be the occasion of corruption.

EXPERIMENT IV.

I LIKEWISE made several experiments with the fixed alkaline salts, and found that they had little less antiseptic powers than the volatile. The trials were both with the ley of tartar and the salt of wormwood. But here we must not confound the disagreeable smell of such mixtures, with one that is really putrid; nor the power which

* The same piece being kept a twelvemonth, continued untainted and as firm as at first.

these lixivials have of dissolving some animal substances, with putrefaction *.

EXPERIMENT V.

FROM these experiments it was natural to conclude, that since acids by themselves were amongst the most powerful antiseptics, and since the alkaline salts were likewise of that class, a mixture of the two to saturation would resist putrefaction little less than the acid alone. But in the trials which I made upon flesh with a *spiritus Mindereri* composed of vinegar saturated with salt of hartshorn, and also with the juice of lemons saturated with the salt of wormwood, I found the antiseptic virtue considerably less than when either the acids or alkalies were used singly.

EXPERIMENT VI.

As to the comparative powers of these salts upon flesh, I observed that half an ounce of lemon-juice, saturated with a scruple of the salt of wormwood, resisted putrefaction nearly as much as fifteen grains of nitre; and when the trial was made with ox's gall, that two drachms of that mixture were more antiseptic than a scruple of nitre. Again, that nitre compared with the

* In the trials upon flesh, I observed that though the fixed alkaline salts seemed at first to loosen the texture of fibrous animal substances, yet after infusion for some days, those pieces not only were not dissolved, but were firmer than others which had lain in water only.

dry neutral salts, weight for weight, was more antiseptic than any which I had tried, in preserving flesh. The *sal Ammoniacus* came next to it, and even exceeded it in the experiment with ox's gall. After these, the *sal diureticus*, *tartarus solubilis*, and *tartarus vitriolatus* seemed to have nearly the same antiseptic qualities.

EXPERIMENT VII.

THUS far I have examined the common neutral salts; which however powerful in resisting putrefaction are inferior to some resinous substances, and even to some plants that I have tried. Thus myrrh, in a watery *menstruum*, was found at least twelve times more antiseptic than sea-salt. Two grains of camphire, mixed with water, preserved flesh better than sixty grains of sea-salt: and I imagine, that could the camphire have been kept from flying off, or concreting to the sides of the phial, half a grain, or even less would have sufficed. An infusion of a few grains of *Virginian* snake-root, in powder, exceeded twelve times its weight of sea-salt. Camomile-flowers have nearly the same quality. The *Peruvian* bark is also antiseptic; and if I have not found it so strong as the two substances last mentioned, I impute that, in some measure, to my not having been able to extract all its embalming parts in water.

Now,

Now, the watery infusions of vegetables possessing this balsamic virtue are the more valuable, in that being usually free of acrimony, they may be taken in greater quantities than either spirits, acids, resins, or even the neutral salts. And as in the great variety of substances answering this purpose, there may be some offensive, or useful qualities annexed, it would not be amiss to review some part of the *materia medica* with this intention.

I shall add, that besides this extraordinary power in preserving bodies, I have discovered in some of those substances a sweetening or correcting quality, after putrefaction had actually begun. But those experiments I shall lay before the Society at some other time, with a table of the comparative force of salts, and some further remarks upon the same subject.



PAPER II.

A continuation of the experiments and remarks upon antiseptic substances. A table of the comparative powers of salts in resisting putrefaction. Of the antiseptic quality of several resins, gums, flowers, roots and leaves of vegetables, compared with common salt. Attempts to sweeten corrupted animal substances by means of camomile-flowers, and the Peruvian bark. A conjecture about the cause of intermitting fevers, and about the action of the Bark in curing them.

Read Nov. 21,
1750.

HAVING in my last paper just mentioned the comparative force of a few salts, and of other substances in resisting putrefaction, I shall now lay before the Society a particular account of those experiments, and of some other which I have made on that subject.

EXPERIMENT VIII.

THREE pieces of the lean of fresh beef, each weighing two drachms, were put separately into wide mouthed phials. Two ounces of cistern-water were added to each; in one, were dissolved thirty grains of sea-salt*; in another, sixty; but the third contained nothing but flesh and water.

* All these experiments were made with the white or boiled salt in common use here.

These phials were little more than half full, and being corked were placed in a lamp-furnace regulated by a thermometer, and kept about the degree of the heat of the human body.

In about ten or twelve hours after, the contents of the phial without salt had a faint smell, and in two or three hours more became putrid *. In an hour or two longer, the flesh with the least salt was tainted, but that which had most remained sweet above thirty hours after infusion. This experiment was often repeated with the same result, allowance being made for some small variations in the degree of heat.

The use of the experiment was for making standards, whereby to judge of the septic, or antiseptic strength of bodies. Thus, if water with any ingredient preserved flesh better than without it, or better than with the addition of the salt, that ingredient might be said to resist putrefaction more than water alone, or water with thirty or sixty grains of sea-salt. But if, on the other hand, water with any addition brought on corruption faster than when pure, the substance added was to be reckoned a promoter of putrefaction.

* These pieces were intire. But when they are beaten to the consistence of a pulp, with the same quantity of water, the putrefaction begins in less than half the time mentioned above.

The following experiments were therefore all made in the same degree of heat, with the quantities of flesh, water, and air above specified ; together with such septic, or antiseptic substances as shall be afterwards mentioned, and were all compared with the standards. But as the smallest quantity of salt preserved flesh little longer than plain water, I have always compared the several antiseptic bodies with the largest quantity ; so that whenever any substance is said to oppose putrefaction more than the standard, I mean, more than sixty grains of sea-salt dissolved in two ounces of water.

EXPERIMENT IX.

I THEN examined other falts, and compared them in the fame quantity with the ftandard, which being of all the weakeft refifter of putrefaction, I fhall fuppofe it equal to unity, and exprefs the proportional ftrength of the reft in higher numbers, as in the following table.

A table of the comparative powers of salts in resisting putrefaction.

<i>Sea-salt</i>	-	-	-	-	-	-	-	-	I
<i>Sal gemmæ</i>	-	-	-	-	-	-	-	-	I +
<i>Tartarus vitriolatus</i>		-	-	-	-	-	-	-	2
<i>Spiritus Mindereri</i>		-	-	-	-	-	-	-	2

Tartarus

<i>Tartarus solubilis</i>	-	-	-	-	-	-	-	2
<i>Sal diureticus</i>	-	-	-	-	-	-	-	2 +
<i>Sal Ammoniacus</i>	-	-	-	-	-	-	-	3
Saline mixture	-	-	-	-	-	-	-	3
Nitre	-	-	-	-	-	-	-	4 +
Salt of hartshorn	-	-	-	-	-	-	-	4 +
Salt of wormwood	-	-	-	-	-	-	-	4 +
Borax	-	-	-	-	-	-	-	12 +
Salt of amber	-	-	-	-	-	-	-	20 +
Alum	-	-	-	-	-	-	-	30 +

In this table I have marked the proportions by integral numbers, it being difficult, and perhaps unnecessary, to bring this matter to more exactness; only to some I have added the sign +, to shew, that those salts are stronger than the number in the table by some fraction; except in the three last, where the same sign imports that the salt may be stronger by some units *. The vitriolated tartar is rated at 2, though more than thirty grains were taken to equal the standard; but as I perceived that all of it was not dissolved, an allowance was made accordingly. On

* Five grains of borax was the smallest quantity compared with sixty grains of sea-salt; but from its holding out so much longer, I suspect that three grains would have been sufficient; in which case the force of this salt was to be estimated at 20: a singular instance of the strength of a salt, which, so far from being acid, is rather alkaline, if we may judge by its urinous taste. One grain of alum was weaker than sixty grains of sea-salt, but two grains were stronger. The power therefore of alum lies between 30 and 60, but by the experiment nearer the first of these numbers.

the other hand, as part of the hartshorn flies off, its real force must be greater than is shewn by the table. The salt of amber is little volatile; but as three grains thereof were found more preservative than sixty of the sea-salt, it must therefore be more than twenty times stronger. This is indeed an acid salt; but as the acid part in so small a quantity is inconsiderable, it should seem that the antiseptic power is owing to some other principle. The *spiritus Mindereri* was made of common vinegar and salt of hartshorn; the saline mixture, of salt of wormwood saturated with lemon-juice*. The alkaline part in either of these mixtures, with water only, would have resisted with a power of 4+; so that the acid added, rendered these salts less antiseptic; viz. the *spiritus Mindereri*, by one half; and the saline mixture, by a fourth part, which was a circumstance quite unexpected.

EXPERIMENT X.

I. I PROCEEDED to try resins and gums, and began with myrrh. As part of that substance dissolves in water, eight grains were made into an emulsion; but most of it subsiding, I could not reckon on a solution of more than one or two grains, which nevertheless having preserved the

* Both the *spiritus Mindereri* and the saline mixture being in a liquid form are compared with the dry salts, upon the quantity which they contain of the alkaline salt.

flesh longer than the standard, we may account the soluble part of myrrh perhaps about thirty times stronger than sea-salt.

2. *Aloe*, *asa fetida*, and *terra Japonica* dissolved in the same manner as myrrh, like it subsided, and had the same antiseptic force. But gum *Ammoniacum* and *sagapenum* shewed little of this virtue; whether it was, that they opposed putrefaction less, or that most of the antiseptic principle fell with the grosser parts to the bottom. Three grains of opium, dissolved in water, did not subside, and resisted putrefaction better than the standard. But I observed, that more air than usual was generated here, and that the flesh became more tender than with any of the stronger antiseptics.

3. Of all the resinous substances, I found camphire the strongest resister of putrefaction. Two grains dissolved in one drop of spirit of wine, five grains of sugar and two ounces of water, exceeded the standard; though during the infusion most of the camphire flew off, swam at the top, or stuck to the phial. If we suppose only the half lost, the remainder was at least sixty times stronger than sea-salt; but if, as I imagine, the water suspended not above a tenth part, then camphire will be three hundred times more antiseptic than sea-salt. That nothing might be ascribed to the minute portion of the spirit used in this experiment, I made another solution of camphire in a drop or

two of oil, and found that mixture less perfect, but still beyond the standard.

EXPERIMENT XI.

1. I MADE strong infusions of camomile-flowers, and of *Virginian* snake-root; and finding them both much beyond the standard, I gradually lessened the quantity of these materials, till I found five grains of either impart a virtue to boiling water superior to the standard. Now, as we cannot suppose that these infusions contained half a grain of the embalming part of these vegetables, it follows, that this substance must be at least an hundred and twenty times more antiseptic than common salt.

2. I also made a strong decoction of the *Peruvian* bark, and infused a thin bit of flesh in two ounces of it strained; which flesh did not corrupt, though it remained two or three days in the furnace after the standard was putrid. During this time, the decoction become gradually limpid, whilst the grosser parts subsided: by which it appears, that a most minute portion of the Bark (perhaps less than of the snake-root or camomile-flowers) intimately mixed with water is possessed of a considerable antiseptic virtue.

3. Besides these, pepper, ginger, saffron, contrayerva-root, and galls, in the quantity of five grains each, as also
ten

ten grains of dried sage, of rhubarb, and of the root of wild valerian *, separately infused, exceeded sixty grains of salt. The leaves of mint, angelica, groundivy, fennel, green tea and red roses; as also the tops of common wormwood, mustard-seed, and horseradish-root were likewise severally infused, but in larger quantities, and proved more antiseptic than the standard. And as none of these can be supposed to yield in the water above a grain or two of the embalming principle, we may look upon them all as powerful resisters of putrefaction. Further, I made a trial with the decoction of white poppy-heads and another with the expressed juice of lettuce, and found them both above the standard.

By these specimens we may now see how extensive antiseptics are; since, besides salts, vinous spirits, spices and acids commonly known to have this property, many resins, astringents and refrigerants are of the number; and even those plants called alkalescent, and supposed promoters of putrefaction; of which class horseradish is particularly antiseptic. And indeed after these trials, I expected to find almost all substances endowed with some degree of this quality, till, upon further experiments, I perceived that some made no resistance, and others promoted corruption. But before I enter upon that part of my subject, it will be

* Although the experiment was made with ten grains of the powder of this root only, yet, considering how long that quantity resisted putrefaction, we may reckon the valerian among the strongest antiseptics.

proper to relate some other experiments more nearly connected with the preceding.

EXPERIMENT XII.

HAVING seen how much more antiseptic these infusions were than sea-salt, I then tried whether plants would part with this virtue without infusion. For this purpose, taking three small slices of the lean of beef, each not exceeding the thickness of half a crown, into one I rubbed the powder of the *Peruvian* bark, into another that of snake-root, and into a third that of camomile-flowers. It was in the heat of summer, yet after keeping these pieces for several days, I found the flesh with the Bark but little tainted, and the other two quite sweet. The substance of all the three was firm; in particular that piece with the camomile was so hard and dry that it seemed incorruptible. The reason why the Bark had not altogether the same effect, probably depended on its closer texture.

EXPERIMENT XIII.

I HAVE also made some attempts towards the sweetening of corrupted flesh, by means of mild substances; because distilled spirits, or strong acids, the substances which might be supposed the most likely to answer this intention, are of too acrid and irritating a nature to be thoroughly
useful

useful when this correction is most wanted. As to salts, besides their acrimony, it is well known that meat once tainted will not take salt.

A piece of flesh weighing two drachms, which in a former experiment had become putrid (and was therefore very tender, spongy and floated in water) was thrown into a few ounces of a strong infusion of camomile-flowers, after expressing the air, in order to make it sink in the fluid. The infusion was renewed twice or thrice in as many days; when perceiving the *fætor* gone, I put the flesh into a clean bottle, with a fresh infusion: this I have kept all the summer, and have it still by me, quite sweet, and of a firm texture *. In the like manner, I have succeeded in sweetening several thin pieces of corrupted flesh, by repeated affusions of a strong decoction of the *Peruvian* bark; and I have constantly observed, that not only the offensive smell has been removed, but a firmness restored to the fibres.

Now, since the Bark parts with so much of its virtue in water, it is natural to think that it may yield still more in the body, when opened by the *saliva* and the bile, and therefore that in some measure it operates by this antiseptic virtue. From this principle we may perhaps account for its success in gangrenes, and in the low state

* This piece I kept a twelvemonth after this paper was read before the Society, and I found it then still firm and uncorrupted.

of malignant fevers, when the humours are evidently putrid. And as to intermitting fevers, in which the Bark is most specific, were we to judge of their nature from circumstances attending them in climates and in seasons most liable to the distemper, we should assign putrefaction as one of the principal causes. They are the great endemic of marshy countries, and prevail most after hot summers, with a close and moist state of the air. They begin about the end of summer, and continue throughout autumn, being at the worst when the atmosphere is most loaded with the *effluvia* of stagnating water, rendered more putrid by vegetables and animals dying and rotting in it. At such times all meats are quickly tainted, and dysenteries, with other putrid disorders, coincide with these fevers. The heats dispose the blood to acrimony; the putrid *effluvia* are a ferment*; and the fogs and dews, so common in such situations, stop perspiration, shut up the corrupted humours, and bring on a fever. The more these causes prevail, the easier it is to trace this putrefaction. The *nausea*, thirst, bitter taste of the mouth, and frequent evacuations of corrupted bile are

* It will be proper to remark, that when I use here (as in the preceding Observations) the word *ferment* to denote the cause that changes the humours, I mean only to express the assimilating power of all putrid animal substances over the fresh, as shall be explained more fully in the next paper, under experiment xviii. There seemed to be the more need for this caution, as in one of the subsequent papers I am to shew, that putrid animal substances become ferments in the strictest sense, that is, act like yeast, when joined to any vegetable substance capable of a vinous fermentation: see exper. xxviii. and the following.

common.

common symptoms, and arguments for what is advanced. We shall add, that in moist countries, and in bad seasons, the intermittents not only begin with symptoms of a putrid fever, but, if unduly treated, are easily changed into a malignant form, with livid spots or blotches of the skin, or a mortification of the bowels. But at the same time we must acknowledge, that such is the quick action of the Bark in removing these fevers, that its febrifuge quality must be something different from its antiseptic. I shall only remark, that whatever medicines (besides evacuations and the Bark) have been found useful in the cure of intermittents, they are, so far as I know, mostly powerful correctors of putrefaction, such as myrrh, camomile-flowers, wormwood, tincture of roses, alum with nutmeg, vitriolic or strong vegetable acids with aromatics.

Thus far having recited my experiments upon flesh or the fibrous parts of animals, I shall proceed to shew what effects the antiseptics have upon the humours. For, though from analogy we might conclude, that whatever retards the corruption of the solids, or recovers them after they are tainted, will act similarly upon the fluids, yet, as this does not certainly follow, I judged it necessary to make some new trials, which, with some experiments on the promoters of putrefaction, the reverse of the former, shall be offered to the society at a future meeting.

PAPER III.

Experiments on substances resisting the putrefaction of animal humours, with their use in medicine. Astringents always antiseptics, but antiseptics have not always a manifest astringent. Of the use of putrefaction in general, and particularly in the animal economy. Of the different means of inducing putrefaction. Some substances reputed septic have a contrary quality. And the real septics are some of those very substances which have been the least suspected to be of that nature, viz. chalk, the testacea, and common sea-salt.

Read Nov. 15,
1750.

HAVING given an account of the manner in which I tried the power of antiseptics on the fibrous parts of animals, I shall but just mention the result of some experiments made with them upon the humours*.

EXPERIMENT XIV.

DECOCTIONS of wormwood, and of the *Peruvian* bark, also infusions of camomile-flowers, and of snake-root, preserved yolks of eggs several days longer not only than

* All the following experiments, whether made in the lamp-furnace, or by the fire, were made in a degree of heat equal to that of the human blood, viz. about 100 degrees of FAHRENHEIT's scale.

water.

water did alone, but also when some sea-salt was added to it. I likewise found that salt of hartshorn preserved this substance better than four times its weight of sea-salt.

EXPERIMENT XV.

Ox's gall was kept some time from putrefaction by small quantities of the ley of tartar, spirit of hartshorn, *sal Ammoniacus*, and the saline mixture; and still longer by a decoction of wormwood, infusions of camomile-flowers, and of snake-root; by solutions of myrrh, camphire, and salt of amber: all these were separately mixed with gall, and found more antiseptic than sea-salt, and seemingly in proportion to their effects upon flesh. Only nitre failed, which though four times stronger than sea-salt in preserving flesh, is inferior to it in preserving gall, and much weaker than *sal Ammoniacus*; which, again, is somewhat less powerful than nitre in keeping flesh sweet. The nitre was soon opened by the gall, and emitted much air, which rose as from a fermenting liquor; and when this happened the gall began to putrefy*. But the saline mixture generated no air, and opposed the putrefaction of the gall more than it did that of the flesh.

EXPERIMENT XVI.

THE last trial was with the *serum* of human blood, which was preserved by a decoction of the Bark, and by

* Perhaps this may be the reason why, as far as I have observed, nitre disagrees with the stomach in putrid bilious cases.

an infusion of snake-root. But saffron and camphire were not here above a fourth part so antiseptic as before: whether it be that they are less preservative of this humour, or, as I suspect, that they were not well mixed with it. Nitre acted nearly with its full force, being about four times stronger than sea-salt; and it generated some air, but much less than it did with the gall. No other humour was tried: but from these specimens added to the former experiments we may conclude, that whatever is a preservative of flesh, will be universally antiseptic, though perhaps not always with the same force.

EXPERIMENT XVII.

HAVING already shewn how putrid flesh may be sweetened, I shall conclude this part of my subject with a like trial upon the yolk of an egg. A portion of this being diluted with a little water, stood till it was corrupted, when a few drops were put into a phial with two ounces of pure water, and about twice as many drops were mixed with a strong infusion of camomile-flowers. At first both phials had some degree of a putrid smell; but being corked, and kept a few days near a fire, in about the degree of animal heat, the mixture with plain water contracted a strong *fætor*, whilst the other smelled only of the flowers.

Thus far I have related the experiments made upon antiseptics; by which it appears, that besides spirits, acids, and salts, we are possessed of many powerful resisters of
putre-

putrefaction, endowed with qualities of heating, and cooling, of volatility, astringency, and the like; which make some more adapted than others to particular indications. In some putrid cases many correctors are already known, in others they are wanting. We are yet at a loss how to correct the *sanies* of a cancerous ulcer; but in such a multitude of antiseptics, it is to be hoped that some will be found at last adequate to that intention.

It may be further remarked, that as different distempers, of the putrid kind, require different antiseptics, so the same disease will not always yield to the same medicine. Thus the Bark will fail in a gangrene if the vessels are too full, or the blood is too thick. But if the vessels are relaxed, and the blood resolved, or disposed to putrefaction, either from a bad habit, or from the absorption of putrid matter, then is the Bark specific. With the same caution are we to use it in wounds, *viz.* chiefly in the cases of absorbed matter, when it infects the humours and brings on a hectic fever. But when inflammatory symptoms prevail, the same medicine by increasing the tension of the fibres (a state very different from the other) has such consequences as may well be expected.

By the success of the Bark in so many putrid disorders, it should seem that astringency had no small share in the cure*; and indeed the very nature of putrefaction con-

* All astringents seem to be strong antiseptics; and all antiseptics probably have some astringent quality, though not always manifest.

sists in a separation and disunion of parts. But as there are other cases in which astringency is less wanted, we may find in the contrayerva-root, snake-root, camphire, and other substances, a strong antiseptic power, with little or no appearance of astringency. And as several of these medicines are also diaphoretic, their operation, in this respect, may for that reason be the more successful.

I come now to the second thing proposed, which was to give an account of some observations that I have made on substances hastening or promoting putrefaction; an inquiry not less useful than the former. For, setting aside the offensive idea commonly annexed to the word putrefaction, we must acknowledge it to be one of the instruments of Nature, by which some great and salutary changes are brought about. With regard to medicine, we know that neither animal nor vegetable substances can become aliment without undergoing some degree of putrefaction. Some distempers may proceed from a want of it *; the *crisis* of fevers seems to depend upon it †; and perhaps

* Some learned authors mean the same thing, when they express this by a defect of a due degree of *alkalescence* in the humours; but I have shewn in my first paper how liable that term is to objections.

† It is observable, that HIPPOCRATES entertained the same idea, since he oftener than once uses the word signifying *to putrefy*, as synonymous to that which signifies *to concoct*. Thus FOËSIUS remarks, Σήπειν, *quod est putrefacere*, HIPPOCRATI *concoquere significat; ut et σήψις, concoctionem*. Vid. Oecon. HIPPOCRAT. in voce Σήπειν. In the

perhaps even animal heat, according to the late Dr. *Stevenson's* theory*.

But in the prosecution of this subject I have met with few real septics, and found many substances, commonly accounted such, to be of an opposite nature. The most general means of accelerating putrefaction are by heat, moisture, and stagnating air, which being sufficiently known and ascertained, I passed over without making any new experiments about them. But Lord *Bacon*†, as

the former editions, by mistake, I quoted GORRÆUS for FOËSIUS; though indeed GORRÆUS, the younger, in his edition of the *Definitiones Medicæ* makes much the same remark under the article Σηπτικὴ κοιλίη, when to that expression he adds “HIPPOCRATI libello περὶ ανατομῆς de ventriculo dicitur ubi fit concoctio, velut cibos concoquens aut putrefaciens.” Now, that the concoction of the humours is a kind of putrefaction, seems probable from hence, that whenever they are in that state, they are generally more fluid, and fitter to pass through the smaller vessels, where they stagnated before. But resolution or tenuity is one inseparable character of putrefaction. And we often find in the offensiveness of the sweats, or in other excretions consequent on a *crisis*, indisputable marks of corruption. The time of resolution or putrefaction depends on the degree of heat, the habit of the patient, and on the part obstructed: hence may arise the variety in the duration of fevers of different kinds, and the uniformity among others that are of a like nature. Resolution is the putrefaction of the impacted humour only, but suppuration implies a corruption of the vessels also. This manner of speaking has been disused, from the prejudice that nothing is putrid but what is offensively so; whereas, in fact, every fibre becoming more tender, and every humour becoming thinner, may be considered as resolved or putrid in some degree; whether the change tends to the better health, or to the destruction of the person; or whether it becomes grateful, or offensive to the senses.

* See his Essay on the Cause of Animal Heat, inserted in the Medical Essays, vol. v. In that treatise, the reader will find some curious observations relating to animal putrefaction.

† Nat. Hist. cent. iv. exper. 330.

well as some of the chemists, having hinted at a putrid fermentation, analogous to what is found in vegetables, and this having so near a connexion with contagion, I made the following experiments for a further illustration of that doctrine.

EXPERIMENT XVIII.

A THREAD being dipped in the yolk of an egg already putrid, a small portion of it was cut off and put into a phial, with half of the yolk of a new-laid egg diluted with a little water. The other half, with as much water, was put into another phial; and both being corked were set by the fire to putrefy. The result was, that the thread infected the fresh yolk; for the putrefaction was sooner perceived in the phial that contained the thread, than in the other. But this experiment was not repeated.

In this manner the putrefaction of meat advances quicker in a confined than in a free air; for as the most putrid parts are also the most volatile, they incessantly issue from a corrupting substance, and are dispersed with the wind; but in a stagnation of the air they remain about the body, and by way of ferment excite it to corruption*.

EXP E-

* *Corpus in putredine existens, alii (corpori) a putredine libero facillimè corruptionem conciliat; quia illud ipsum (corpus) quod in motu intestino jam positum est, alterum quiescens,*

EXPERIMENT XIX.

As to other septics received by authors, I found none of them answer the character. The alkaline salts have been considered as the chief putrefiers; but this is disproved by experiments. Of the volatiles it may indeed be observed, that though they preserve animal substances from the common marks of putrefaction, with a force four times greater than that of sea-salt, yet, in warm infusions, a small quantity of these salts will soften and

quiescens, ad talem motum tamen proclive, in eundem motum intestinum faciliè abripere potest. STAHLII *Fundam. Chymicæ, par. ii. tract. i. sect. i. cap. v.* In this light STAHL and other celebrated chemists have considered a *putrid ferment*, and generally used the same expression for it. BECCHER (*in Physic. Subterræ. lib. i. sect. v. cap. i. n. 34.*) treating of a corrosive putrid substance taken in aliment, says of it, *fermentum universo sanguini imprimit.* And Mr. BOYLE has used the words *fermentation* and *putrefaction* of the blood promiscuously in his piece called *Observations and Experiments on the Human Blood*. But these authors are nevertheless very careful not to confound putrefaction with vegetable fermentation, accounting them only analogous processes; and therefore use the same term to express both the putrefying and fermenting agent, from the want of more expressive words in the languages in which they wrote. It were to be wished, that to avoid ambiguity we had two different words to denote the exciting cause of these two intestine motions; but this is the less to be expected, on account of the disposition of all putrid animal substances to promote both animal putrefaction, and a vinous fermentation in vegetables, as will appear by the sequel of these experiments.

I have insisted the longer on this point, as I apprehended my use of the term *ferment* in the preceding *Observations* might induce some readers to think, that I had endeavoured to revive the exploded doctrine of a fermentation of the blood, like that which takes place among vegetable substances, than which nothing could be more contrary to my sentiments.

relax the fibres more than water does by itself. They also prevent the coagulation of blood; and when taken by way of medicine, perhaps thin and resolve it; but they are not therefore septics. For, so little do these salts putrefy, or even resolve the fibres, when applied dry, that I have kept in a phial a small piece of flesh, preserved with salt of hartshorn only, since the beginning of June last (about five months ago;) during which time, though the summer was hotter than usual, it has remained not only sound, but firmer than when it was first salted *.

EXPERIMENT XX.

FROM the specimens we had of the antiscorbutic plants, it is likewise probable that none of that class will prove septic. Horseradish, one of the most acrid, is a powerful antiseptic. And though carrots, turnips, garlic, onions, celery, cabbage, and colewort were tried, as alkalescents, they did not hasten, but retard the putrefaction.

EXPERIMENT XXI.

THE case was somewhat different with such farinaceous vegetables as I examined, *viz.* white bread in water, decoctions of flour, barley, and oatmeal; for these infused with flesh did not retard its putrefaction, but

* This piece of flesh continued uncorrupted above a year after this paper was presented to the Society, and then I inspected it no longer.

after

after that process was somewhat advanced, they checked it by turning sour. And by a long digestion, the acidity became so considerable that it conquered the putrescency of the flesh, and generated much air. These phials did not then ill represent the state of weak bowels, in which bread and the mildest grains are converted to such an acid, as prevents the due resolution and digestion of animal food*.

EXPERIMENT XXII.

I EXAMINED the powder of *cantharides*, of vipers, and of *Russian* castor, all animal substances, and therefore most likely to prove septic. The flies were tried both with fresh beef, and with the *serum* of human blood; the vipers, with the former only; but neither of them hastened putrefaction. And as to the castor, it was so far from promoting that process, that an infusion of twelve grains opposed putrefaction more than the standard.

EXPERIMENT XXIII.

AFTER finding no septics where they were most expected, I discovered some which seemed the least likely, *viz.* chalk, the *testacea*, and common salt.

* It is to be remarked, that in making this experiment, I did not then attend to a fermentation that ensued, and which was the cause of the acidity. This kind of fermentation between animal and vegetable substances, having been hitherto overlooked, shall be set forth in my next paper.

Twenty grains of prepared crabs-eyes were mixed with six drachms of ox's gall and as much water; into another phial I put nothing but gall and water, in the same quantity with the former; and both being placed in the furnace, the putrefaction began much sooner where the absorbent powder was, than in the other phial. I also infused, in the same furnace, thirty grains of levigated chalk, with the usual quantity of flesh and water*; and having shaken the phial from time to time, I found that the corruption not only began sooner, but rose higher by this mixture; nay, which had never happened before, that in a few days the flesh was resolved into a perfect *mucus*. The experiment was repeated with the same result, which being so extraordinary, I suspected that some corrosive substance had been mixed with the powder; but for a proof, a lump of common chalk being pounded, thirty grains thereof proved fully as septic as the former. The same powder was compared with an equal quantity of salt of wormwood, and care was taken to shake both the mixtures equally; but after three days warm digestion, the salt had neither tainted nor softened the flesh, whilst the chalk had rotted and consumed that piece which was infused with it. Nor was the septic power of the testaceous powders of the Dispensatory less. But egg-shells in water seemed to resist putrefaction, and to preserve the meat longer than water did without them†.

* *Viz.* of flesh two drachms, and of water two ounces.

† The trial was made only with a coarse powder of egg-shells, and not repeated.

EXPERIMENT XXIV.

To try whether the *testacea* would also dissolve vegetable substances, I mixed them with barley and water, and compared this mixture with another of barley and water only. After a long maceration by a fire, the plain water swelled the barley, became mucilaginous and sour; but that with the powder kept the grain to its natural size, and though it softened it, yet produced no mucilage, and did not become acid.

EXPERIMENT XXV.

Nothing could be more unexpected than to find sea-salt a hastener of putrefaction; but the fact is thus. One drachm of salt preserves two drachms of fresh beef, in two ounces of water, about thirty hours uncorrupted, in a heat equal to that of the human body; or, what amounts to the same, this quantity of salt keeps flesh sweet twenty hours longer than pure water; but half a drachm of salt does not preserve it above two hours longer than pure water. This experiment has been already mentioned. Now, I have since found that twenty-five grains have little or no antiseptic virtue, and that ten grains both hasten and heighten the corruption*. It is

* I found the most putrefying quantity of salt, with this proportion of flesh and water, to be about eight or ten grains.

further

further to be remarked, that in warm infusions with these smaller quantities, the salt, instead of hardening the flesh (as it does in a dry form, in brine, or even in strong solutions, such as our standard) softens and relaxes its texture more than plain water does, though much less than water with chalk, or water with the testaceous powders.

Several inferences might be drawn from this experiment, but I shall only mention one at present. Salt, the indispensable seasoner of animal food, has been supposed to act by an antiseptic quality, correcting the too great tendency of meats to putrefaction: but since it is never taken in aliment beyond the proportion of the corrupting quantities in our experiment, it would seem that salt is subservient to digestion chiefly by its septic virtue, that is, by softening and resolving meats, an action very different from what is commonly imagined*.

* BECCHER is the only author, I know of, who hints at the resolving quality of sea-salt, and also at its corrosive and putrefying nature when taken too freely in aliment. *Vid. Physic. Subterranean. lib. i. sect. v. cap. i. n. 34.*

It is to be observed, that all these experiments were made with the salt kept here for domestic uses.

PAPER IV.

A continuation of the experiments upon septics. Conjectures about the causes of the decline of putrid diseases. Of the difference between the effects of the testacea and lime-water. An account of a power discovered in putrid animal substances of exciting a vinous fermentation in vegetables; and of what use the saliva is in that process: with an application of these experiments to the theory of digestion.

Read April 25, 1751. **I**T being so established an opinion, that salt resists putrefaction with a power proportioned to its quantity, I did not therefore rely on my first trials, but often repeated that experiment which contradicted this maxim; and I still found, that two drachms of fresh beef, with five, ten, or even fifteen grains of sea-salt and two ounces of water, putrefied sooner than the same quantity of flesh infused with water only.

EXPERIMENT XXVI.

1. I NEXT inquired, whether small portions of other neutral, or alkaline salts, were in like manner septic; but upon examining *tartarus vitriolatus*, *sal Ammoniacus*, nitre, *sal diureticus*, as also salt of hartshorn, and salt of

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wormwood, I could not perceive that they were ; though all of them, in weak solutions, were found to soften or resolve the flesh ; salt of hartshorn most, and nitre least of any.

2. Nor does sugar at all promote putrefaction. A plain syrup has been said to preserve meat better than any brine ; and the trials which I have made induce me to think that this is true : as also, that weak solutions of sugar are proportionally antiseptic. But, what is remarkable here, though weak solutions of sugar soon yield to the putrefaction of flesh, yet as soon as an acidity is produced from the sugar's fermenting, that putrid tendency is either retarded, or intirely overcome. Therefore in sugar, the effects both of the *farinacea* and salts seem to be combined ; for, as a salt, it opposes putrefaction at first, which the *farinacea* do not ; and like the *farinacea*, it checks putrefaction after the fermentation begins.

To this antiseptic quality in sugar (which, for these hundred years past, has been daily joined in large quantities to other acescent food) we may perhaps attribute some share of the general decline of putrid diseases. For now, we seldom hear of leprogies *, putrid scurvies, dysenteries, pestilential fevers, and the like distempers, formerly so frequent, and to which those were most subject who

* *Viz. the lepra Arabum.*

used animal food in excess, especially salted meats *. No doubt other causes concur, but to enumerate them would be foreign to our present purpose, as well as to mention the inconveniences that, on the other hand, may arise from the immoderate use of such things as too much oppose putrefaction.

3. I have also repeated the experiments with the *testacea*, and in particular on human blood, and have found that crabs-eyes promoted the putrefaction of the *crassamentum*, and likewise that of the *serum*, but the latter not so speedily.

EXPERIMENT XXVII.

1. HAVING a mind to see the action of the *testacea* combined with the antiseptics, I infused half a drachm of the compound powder of contrayerva-root with the usual quantity of flesh and water, and observed that the testaceous part of this composition did sensibly weaken the vegetable, which is one of the strongest antiseptics. For, though upon the whole the powder did indeed resist putrefaction, it was with less efficacy than if the small portion of the root, which enters the composition, had been used alone †.

2. To

* Add what is said in the Observat. part iii. ch. vi. § 6.

† The high opinion which some physicians of the last century entertained of the *testacea* was founded on the *hypothesis*, that most diseases proceeded from an acid,

2. To this examination of chalk and the *testacea*, were added some experiments upon lime-water, made both of chalk-lime and oyſter-shell-lime (for ſtone-lime is not in uſe here) and I found, that though fleſh infuſed in either immediately ſent forth a diſagreeable ſmell, as in a common ley, yet it did not become putrid ſo ſoon as the ſtandard. So that in this trial, lime-water made ſome reſiſtance to putrefaction, though the materials of which it was made, namely chalk and ſhells, are both ſeptics. Nevertheless, I obſerved that when the putrefaction began, it became little leſs offenſive in this than in common water*. And though it has been often found by

not even fevers excepted. Now, though this theory is at preſent much limited, yet the practice is ſtill common, at leaſt in acute diſorders; ſome uſing theſe powders from cuſtom, and others with a view to neutralize the acids then given, to fit them for entering the lacteals, and promoting a *diaphoreſis*. Otherwiſe it does not appear how theſe abſorbents ſhould correct any acrimony, either in the *primæ viæ*, or in the blood. But whatever diſputes have ariſen about their manner of operating, almoſt all have agreed in believing them harmleſs; though from theſe experiments we may perhaps be led to doubt whether they are ſo always. However, I would not from hence infer, that the *teſtacea* are only to be given when an acid is to be deſtroyed; ſince to cure ſome diſeaſes, it may be requiſite to attenuate the humours, and relax the fibres by ſome degree of putrefaction. HIPPOCRATES obſerves, that a fever is the beſt remedy for ſome diſorders. And the primary effects of mercurials conſiſt in a ſeptic reſolution both of the fibres and humours. Poſſibly therefore the *criſis* of ſome fevers may be haſtened, or perfected by the *teſtacea*, which we have ſhewn to be ſubſtances endowed with a conſiderable putrefying quality.

* The Rev. Dr. HALES having ſince made ſome experiments upon lime-water, confirms what is here ſaid about the little antiſeptic quality of ſhell or chalk-lime. And though he does not mention his having ever found them act as ſeptics, yet he lays before the Royal Society my account how that may happen, *viz.* whenever the chalk or ſhells are not ſufficiently calcined. Phil. Tranſact. vol. xlviii. n. 103.

others,

others, that the water of stone-lime is in some degree constantly antiseptic, yet I think it probable that the virtues of this medicine do not so much consist in correcting putrefaction, as in checking immoderate acidities and concretions, the cause of several chronic diseases.

Thus far I have related my experiments upon substances resisting, and promoting putrefaction; by which it seems probable, that there are a great number of the former, and but few of the latter, though perhaps more than we have yet discovered. In this last part, I have confined my inquiries to such things only as induce putrefaction out of the body; for, as to mercury, and certain poisons, which taken into the stomach, or absorbed by the veins, have the effect of septics, I purposely omitted them, as not being able to take in so large a field. But I shall add, to what I have already laid before the Society, some other observations upon the corruption of animal substances, which have a near relation to the former, and may not be without their use in medicine.

EXPERIMENT XXVIII.

I MADE several mixtures, each consisting of two drachms of raw beef, as much bread, and an ounce of water; these being beaten to the consistence of a pulp were put into close phials, of three or four ounces measure each, and placed in the

the usual heat of 100 degrees. But in this, and in several of the subsequent experiments, the furnace was allowed to cool for some hours every night.

1. In a few hours, all these mixtures began to ferment, and continued in that action about two days *. For the most part the fermentation was so strong, especially when the heat was a few degrees above the standard, that if the corks had not sometimes given way, the phials must have been burst. The bread and flesh, which at first lay at the bottom, soon rose to the top, and constantly, as the air escaped, let fall some particles that had been buoyed up by that fluid. Thus a sediment was formed resembling lees, whilst the lightest parts or *flowers* remained on the surface; but the fermentation continuing, these also subsided; and the acid taste and smell of the liquors, after the action ceased, was a further proof of the preceding fermentation. This change was the more extraordinary, as these mixtures, when the motion began, were tending to corruption, and in fact in a few hours after, became offensive: but the next day, the putrid smell abated, and went quite off before the fermentation had ceased.

2. I repeated these experiments often, and with the same success. And to ascertain the part which the animal substance had in producing such effects, I made mixtures of

* I found afterwards, that when the phials were left quite open, or so that the air could easily escape, the fermentation was completed in less than half that time.

bread and water only ; but these stood several days in the furnace without any sign of fermentation.

3. I added to two drachms of fresh meat double the quantity of bread, and water in proportion ; and having placed this mixture in the furnace, I found the fermentation proceed as before, and with no other difference than that of producing a purer acid.

4. To the same quantity of flesh and an ounce of water, was added only half a drachm of bread ; but a fermentation nevertheless ensued, and the liquor became acid to the taste, but with the smell of rank cheese.

5. Another variation was made with flesh and oatmeal, instead of bread ; but the effects were only different in a higher degree of fermentation, as the oatmeal had not undergone that process before.

6. I tried whether oatmeal and water would ferment alone ; but though they did, the action was not nearly so strong as when an animal substance was added.

7. Experiments were also made with bread and roasted meat, with similar effects ; for, though the putrefaction was but just discernible, and the generation of air was much less than in the first experiment, yet the fermentation was complete, and the mixtures became acid.

8. I varied the quantity, taking of roasted meat and bread each an ounce, with about two ounces of water. This mixture being poured into a phial and corked was left in a room with a fire, where the thermometer rose no higher than about 65 degrees. Here the fermentation began late, and proceeded slowly ; but, what was remarkable, it no sooner commenced, than the mixture, without ever becoming putrid, acquired a vinous smell like that of other fermenting liquors, and towards the end, the usual acid taste and smell succeeded.

9. I mixed half an ounce of bread with an ounce and a half of water, and a small portion of the *crassamentum* of human blood already putrid ; and setting this mixture in the furnace, in a close phial, I observed a strong fermentation some hours after.

10. I discovered the same quality in sheep's gall. For, having put two drachms of bread, with half an ounce of that liquor, in a phial, and placed it in the furnace, I perceived that this mixture, the next day, generated air as in the former experiments. The fermentation continued for two days ; in which time the gall began to putrefy, but recovered afterwards ; so that on the sixth day it seemed to be as uncorrupted as on the first, without becoming acid.

From all these experiments it seems probable, that all animal substances putrid or tending to putrefaction are endowed

dowed with a power of raising a fermentation in the *fari-nacea*, and even of renewing that action in such as have undergone some degree of it before.

11. After such mixtures become sour they never return to a putrid state, but, on the contrary, grow more and more acid, and to such a degree, that I compared one of them (which consisted of raw meat and bread, of each two drachms, and of an ounce of water) with a like mixture, to which was added in the beginning ten drops of the spirit of vitriol, and after both had stood some days in the furnace, I found them equally acid. To account for this, it will be proper to observe, that the addition of the spirit preventing fermentation, the last mixture had no more acidity than what was given to it at first by the spirit of vitriol.

12. I have also remarked, that the acid arising from these processes has something of an austere and saltish taste, but without any offensive smell, unless the phials are kept close during the fermentation; in which case the smell is like that of sour milk, or lean cheese.

Now, considering how much air is generated, and how sour these mixtures are made by fermentation, it may seem strange that the same materials, used as food, should make so little disturbance in the body. And the difficulty

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would be the greater, did the *saliva*, as some suppose, promote both fermentation and putrefaction *.

EXPERIMENT XXIX.

To ascertain the effects of the *saliva* in digestion, I added a small portion of it to some raw beef, and observed that this mixture, in the usual heat, putrefied slower than another which had no *saliva* joined to it.

EXPERIMENT XXX.

I. I TOOK two drachms of fresh meat, the same quantity of bread, and an ounce of water, and to these added as much *saliva* as I supposed necessary for digestion. This mixture being beaten in a mortar was put into a close phial, and set in the furnace, where it remained about two days with scarce any visible fermentation; but on the third day that action became manifest. At that time I found the bread and

* The *saliva* is reckoned by the celebrated STAHL among those substances which are proper to excite a vegetable fermentation. *Vide Fundam. Chym. part. ii. tract. i. sect. i. cap. v.* And the same opinion has generally prevailed, as I imagine from this circumstance. A traveller gives an account of a strange method of making a vinous liquor, in use among one of the *Indian* nations; that is, by first chewing the fruit, or grain, before they put them to ferment. But all that can be inferred from hence, is that the *saliva*, without bringing on the fermentation sooner, may make it more equable and moderate after it begins, as in our experiments; and this may be a necessary circumstance for conducting that process in a hot climate.

flesh risen in the water, a sediment nevertheless forming itself, and bubbles of air continually mounting: in a word, the fermentation was complete, being also distinguished by a vinous smell, as in ordinary *working* liquors. The action continued above twice as long as when no *saliva* was used, and it was more moderate, and generated air with less tumult. When the fermentation intirely ceased, the mixture had a pure acid taste, though weaker than what was produced in the former experiments; and I took notice, that it was without any putrid smell from the beginning.

2. I likewise varied this experiment as I had done the first, by using roasted instead of raw meat, and sometimes oatmeal instead of bread; but the result was still the same. One circumstance may deserve particular notice. An ounce of bread, as much roasted meat, about two ounces of water, and a small quantity of the *saliva*, being beaten together, were allowed to ferment in a heat of sixty five degrees; and having examined the phial with a thermometer, I found it about three degrees warmer than the external air*.

* It is probable, that in a fermentation of this kind the heat increases in proportion to the quantity of the mixture. In so small a quantity, I doubt that neither vegetable substances fermenting, nor animal corrupting, separately, would raise any perceptible degree of heat; though vegetables alone are capable of acquiring an intense heat (so indeed as to break out into a flame) if laid in a great heap, compressed and kept moist. But in that case, a putrefaction beginning, the fermentation is carried on between the septic and the acescent parts, exactly as in the experiment above.

From these last experiments it appears, that if the *saliva* is found, in a sufficient quantity, and well mixed with the aliment, it is qualified for retarding putrefaction, preventing immoderate fermentation, flatulence, and acidity in the *primæ viæ*. But if that humour is deficient, unsound, or not well mixed with what is swallowed, that the aliment may first putrefy, then grow acid, and in that action ferment strongly, and generate much air in the stomach and bowels.



PAPER V.

Experiments and remarks on the fermentation of vegetables, by means of putrid animal substances, continued. An austere acid produced by such fermentations. The probability that most vegetables are fermentable; not excepting the acrid, antiscorbutic or alkaliescent class. Of the fermentation of milk. How far the aliment ferments in the stomach. Of the use of the saliva in alimentary fermentation. Of various causes of indigestion. Of the cause and cure of the heart-burn. And from what cause a sourness of the stomach proceeds.

Read June 20,
1751, **I**N my last paper, I gave an account of some observations which I had made upon the fermentation of the *farinacea*, excited by animal substances, but not having then finished that subject, I shall now lay before the Society a few more experiments relating to it.

EXPERIMENT XXXI.

AFTER having seen the effects of the fresh *saliva*, both in keeping up and moderating fermentation, I was desirous of knowing its qualities when putrid. For this purpose having collected a sufficient quantity, I kept it
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*about three days in the furnace *, and then added the usual proportion thereof to the common mixtures of bread, flesh, and water ; which not only brought on the fermentation sooner, but made it stronger and more productive of air, than would have happened without the *saliva*. The flesh became also more than usually putrid ; but it was at last sweetened by means of the fermentation, so that by the time the action ceased the contents of the phial smelled and tasted sour, without any remains of putrefaction.

From this experiment we find it still more probable, that all animal substances have a power (in proportion to their degree of corruption) of exciting a fermentation in the common *farinacea*.

E X P E R I M E N T XXXII.

I took two drachms of a fresh mackarel skinned, with an equal quantity of bread, and having reduced them to

* *Viz.* Blood-warm, or about 100 degrees of FAHRENHEIT's thermometer ; and the same degree of heat is to be understood as used in the rest of these experiments, unless when it is otherwise expressed.

The late Dr. ALSTON not attending to the note above (which stands in all the editions of this work) in his first Dissertation on Quick-lime, contradicts the result of one of my experiments, from one that he himself had made in a heat no greater than that of the common air, at *Edinburgh*, in the end of April and beginning of May, alleging that I had not specified the degree which I had used in my experiments upon the same substance.

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the usual consistence with an ounce of water, I placed them in the furnace, together with another phial containing the like mixture, but with the addition of fresh *saliva*; and a third, with the same quantities of fresh beef, bread and water only, with which the two former were to be compared. In less than five hours after infusion, the materials in all the phials began to rise, to float in the water, and to ferment; and during the whole process I perceived no difference between the fermentation occasioned by the fish, and that by the flesh, except that the phials with the fish retained the corrupted smell the longest. But next day, the fermentation still subsisting, the acid smell was to be distinguished in all the phials; and on the fourth day (the corks having been drawn the night before) I was scarce sensible of any difference between the first and the third or standard phial, either as to taste, or smell; and both were very acid. But the liquor in the second phial was not so sour, and it yielded such a vinous smell as was taken notice of before, when the fresh *saliva* was added to the common mixture with the beef*.

Having therefore observed, in this instance, such an exact agreement between the effects of fish and of flesh in causing fermentation, and presuming that all fish possessed more or less of the same quality, I did not repeat the experiment with any other sort. For, though I was sensible that for the better regulation of diet, and rightly

* Exper. xxx.

understanding the different effects of different animals, in food, it might be of use to examine in this manner many of the individuals, and to observe which of them were more or less apt to cause fermentation, and to produce more or less of an acid; yet, as such inquiries would have taken up too much time, I omitted them for the present, and pursued the general point, of inquiring how extensive this principle, of exciting fermentation, was among other animal substances.

EXPERIMENT XXXIII.

I MADE therefore a trial with the yolks of new-laid eggs. One of these I mixed with two drachms of white bread and an ounce of water; and another, with the same proportion of bread and water, to which I added some *saliva*. But though both phials were kept four days in the furnace, I could perceive no marks of fermentation, or any tendency to putrefaction in either. Whereupon recollecting M. *de Réaumur*'s observation about the slow putrefaction of un-impregnated eggs, I concluded that either these two happened to be so, and therefore resisted putrefaction so much the longer, or, which was most likely, that by a small degree of acidity in the bread, they had been wholly preserved from corrupting, and of course from fermenting too. So that this experiment ought to make no exception to the general principle, that all animal substances, upon putrefying, become ferments to the *farinacea*.

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EXPERIMENT XXXIV.

HAVING remarked, that the liquor produced by all the fermentations had not only a sour but an austere taste, that I might be sure this did not proceed from alum (which the bakers have been accused of mixing with their loaf-bread) I made a like trial with sea-biscuit; which yielded the same kind of astringent acid as the other; and, as I remember, oatmeal afforded an acid little different from the rest.

Having seen how fermentable some of the *farinacea* are by means of corrupted animal substances, and how probable it is, that the rest of this class agree in the same quality with the specimens, I shall next relate some experiments made upon vegetables of a different kind.

EXPERIMENT XXXV.

IN one phial I put two drachms of fresh beef, with a handful of new-cut spinage, and two ounces of water. In a second, the same quantity of flesh, half an ounce of boiled spinage, and between two or three ounces of water. In a third phial, was the same weight of the meat, with half an ounce of fresh asparagus, and two ounces of water. In a fourth, was the like mixture, but with the asparagus boiled. The fifth contained the same quantity of beef, with a handful of garden scurvygrafs, and two

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ounces of water. The sixth and last phial served for a standard, with a mixture of beef, bread and water only. All these were reduced to a pulp as usual.

In less than five hours after setting them in the furnace, I found, not only the standard, but the contents of the two phials with the asparagus in a fermenting state. The motion was particularly brisk in that with the raw plant; but in both, the fermentation went higher, and generated more air than the standard. In other respects the action was the same; for the flesh acquired at first a putrid smell, and afterwards lost it; and the next day, or about thirty hours after infusion, the acid prevailed; which, though considerably less than that of the standard, yet was sufficient for curdling milk. But the greatest difference between the fermentation of the asparagus, and that of the bread, lay in this, that after the bread-mixture became sour, it remained so; whereas the acidity in the asparagus-mixture was so weak, that in two or three days afterwards, it was entirely overcome by the corruption of the meat.

The process with the spinach was little different: it fermented about an hour later than the standard; and the raw plant somewhat later than the boiled. The fermentation of both was more moderate than either that with the asparagus, or bread; less air being generated, and in a less tumultuous manner. At the same time that the standard became acid, this change was also distinguishable
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in the phials with the spinage, by its curdling of milk: but after this period, as was remarked of the asparagus, both the spinage-mixtures became putrid.

The scurvygrafs also fermented, and as early as the standard, but more moderately and with less flatulence. Its acid was ascertained by the same test with the former, viz. by curdling milk; but herein it differed, that after this change it continued to preserve the meat longer from corruption. By which it appears, that though this plant is without any manifest acid, it is nevertheless a pretty strong resister of putrefaction.

I took the more notice of the fermentation of the scurvygrafs, as being of a class supposed unfermentable; and therefore I repeated the experiment, but with the same result. And since these trials agree with the constant observations upon the virtues of this plant in the marine or marsh-scurvy, it may therefore seem improperly classed with such medicines as correct acidities, and promote putrefaction *. As for the asparagus and spinage, though they contain but a weak acid, yet being fermentable, and in some degree resisters of putrefaction, neither can they be deemed septics, but, at most, vegetables of easy corruption. The readiness with which

* The sea or marsh-scurvy appears to proceed from a putrid acrimony, as the livid blotches, offensive breath, and resolution both of the blood and fibres testify.

the asparagus ferments, seems to correspond with the quickness of its digestion in the stomach. For, from all the experiments which I have made, I am induced to think, that such vegetables as are of the easiest digestion will fall into the speediest fermentation in a blood-warm furnace. Yet excepting these mentioned, I have made trial of no other esculent plants, since I discovered their property of fermenting with corrupted flesh. But I remember, when, for some other intention, I had once made a mixture of flesh, water, and turnip, and left it in the furnace, without regarding it for two or three days, that the liquor then tasted sour; which I presume would not have happened without a previous fermentation. Hence I conjecture, that all the alimentary plants, which are not too bitter, or spicy, will ferment much in the same manner with those mentioned: and I am almost confirmed in this opinion by the following experiment.

EXPERIMENT XXXVI.

1. To an ounce of new-milk were added some drops of the *crassamentum* of human blood resolved by putrefaction, and the phial with this mixture being exposed to the usual heat of an hundred degrees, in a few hours the contents fermented. The intestine motion was considerable, much air was separated, and an acid was produced, which curdled the milk, and corrected the putrid smell.

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2. The experiment was repeated with four ounces of milk, and about two drachms of the corrupted blood; and after six or seven hours quiet infusion, a strong fermentation ensued, by which the glass stopper was forced out, and the froth came over, though the bottle was little more than half full. Now, since milk may be considered as the juice of grass and various other vegetables, but little assimilated into an animal nature, we may from hence judge how prone all vegetables are to ferment with any thing putrid.

There being so near a conformity between the contents of the phials, in most of these experiments, and the aliment in digestion, it is scarce to be doubted, but that a fermentation is begun in the stomach, as often as there is any animal substance to serve for a ferment, and vegetables to be fermented.

That the aliment ferments in the stomach, was believed by some of the chemists; but as they did not explain the manner how, and applied the term *fermentation* to divers operations in nature scarcely analogous to that process, it was no wonder that their theory was wholly rejected by some, and admitted by others with many restrictions. Nor will I infer from any experiment which I have made, that this fermentation is either universal or indispensable; since many live better on a vegetable than on an animal diet. And though in such cases the vegetables may be said

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to ferment with the *saliva*, it is plain that the action must be inconsiderable, and come far short of what results from a mixture of animal food. But then we may observe, that without milk vegetables alone afford but a poor and unwholesome nourishment; and that such as join milk to their vegetables, have therein an animal fluid already somewhat prepared. Again, that those who require a vegetable diet most, are either of a hectic, or scorbutic habit: in which condition the *saliva*, being in a putrid state, may induce that change upon the aliment, which, in better health, would be effected by the corruption of animal food in the stomach. Without these circumstances, a vegetable diet suits those best, who by great exercise or hard labour are able to subdue the viscosity of unfermented chyle. This is the case of the common people in poorer countries, who subsist chiefly on the *farinacea*, and eat no flesh. But whenever such, by age or infirmity, are obliged to leave off work, they become subject to indigestions; and, upon the whole, seem to be less healthy and shorter lived than those who are nourished by a mixture of animal and vegetable substances.

It has been remarked, that the fermentation begins in the phials between four and five hours after infusion; but this we are to understand of the manifest fermentation only; for as to the insensible working of those mixtures, it must be allowed to begin much sooner, and probably from the time they are first set in the furnace. Conformably

ably to which notion, we presume, that after every meal a fermentation is begun, and so far carried on in the *primæ viæ*, that before the chyle enters the lacteals, its particles become as disunited, and the air as much loosened, as in the phials, when the bread and flesh first change their specific gravity and float in the water. But we do not pretend, that in a natural state this ever rises to a vinous or an acetous fermentation, being assured that the chyle is admitted into the blood before it undergoes so considerable an alteration.

We have seen the use of the *saliva* in moderating fermentation, and making it flow; and also in checking the too great propensity of animal substances to putrefaction, and of vegetables to acidity. Now, when the *saliva* is found, and in sufficient quantity, and the aliment well prepared, and not too much of it, the fermentation passes without any tumult, and generates but little air. But in surfeits, or upon swallowing without due mastication; when meats are tough, and fat, or eaten with farinaceous substances unfermented; or when by any accident the *saliva* is vitiated, too small in quantity, or not intimately mixed with the food, the fermentation becomes tumultuous, the stomach swells with air; and this extraordinary commotion being attended with an unusual heat, brings on that uneasiness called the *heart-burn*. And as in the experiments, a certain quantity of the *saliva* was found requisite for keeping the fermentation within bounds

bounds, so in practice we find, that whatever promotes a greater secretion of that humour, or helps to mix it with what we eat, is the best remedy for such indigestions.

3. If an oily substance is added to the common mixture, a stronger fermentation ensues, which cannot be moderated by the usual proportion of the *saliva*, till some fixed alkaline salt be added, as I found upon trial. And as I have also observed, that these salts will, without the *saliva*, not only suddenly stop very high fermentations in the phials, but likewise suppress them for some time, it is no wonder they should be so sure and speedy a remedy in the heart-burn; as they not only render the *saliva* more saponaceous, but suspend the fermentation till more of that humour can be secreted, and mixed with the aliment.

The theory resulting from these experiments may help to account for other disorders of the stomach; but I shall attempt to explain only one more at this time. This is the *sourness* of the stomach, occasioned by a liquor so very acrid as to excoriate the throat, and to set the teeth on edge. In order to learn the cause of this extraordinary acidity, I made various experiments upon our common food; and among others, I made several infusions of bread in water, in different proportions, which after keeping some days blood-warm, in the furnace, became but little acid, and still less when the *saliva* was added.

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And as to flesh, so far is it from turning sour, that its corruption seems directly opposed to acidity. Nevertheless it is certain, that many suffer greatly from an acid, though living on flesh, bread and water only. Now, from the common theory of digestion we shall hardly be able to account for this matter; but easily from the principle of fermentation, by which we find that not only a strong, but an austere acid, may be produced from these very materials, as often as the stomach is relaxed, or any way disabled from conveying the whole aliment into the intestines. For, what is left having time to undergo too long a fermentation, it is thereby changed into a harsh sort of vinegar.



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PAPER

PAPER VI.

Experiments upon substances hastening, retarding, increasing, and diminishing alimentary fermentation, with remarks upon their use in explaining the action of digestion, and shewing how that may be occasionally assisted by acids, bitters, aromatics, wine, &c. What substances come nearest to the saliva in its digestive quality, and how these are to be varied according to the habit. Of the difference between the action of the bile and that of common bitters. Sea-salt, in different quantities, either promotes, or retards alimentary fermentation; but the other septics always hasten that process. In what properties the testacea, lime-water, and the fixed alkaline salts agree, and differ. What aliments are the easiest, and what the hardest of digestion.

*Read October 31,
1751.*

HAVING in the two preceding papers laid before the Society some experiments setting forth the general fermentation of alimentary vegetables, by means of animal substances tending to putrefaction, or already putrid, I shall now finish that part of my subject by reciting some experiments made upon bodies, which either hasten, or retard, increase, or diminish that process; and I shall endeavour, as before, to apply them to use.

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EXPERIMENT XXXVII.

1. To two drachms of fresh beef, and as much bread, were added red port-wine, and water, of each half an ounce. To the same quantity of bread and flesh, in another phial, was put an ounce of common small-beer. In a third phial the bread and flesh were diluted with an ounce of water acidulated with a few drops of the spirit of vitriol. And in a fourth phial were the same materials; only, instead of the spirit of vitriol, I put two drachms of the acid liquor arising from a fermentation of bread, flesh and water. All these mixtures being reduced to the usual consistence, were set in the furnace, where they remained three days, without generating air, or affording any signs of fermentation. But two tea spoonfuls of rum being added to the common mixture, retarded fermentation for some hours only: perhaps a double or triple quantity would have wholly suppressed it.

2. In one of the common mixtures were infused five grains of the *species aromaticæ*; in another, ten grains of cummin-seed; a third, had half a drachm of the filings of the wood of saffrafras; a fourth, five grains of saffron; a fifth, five grains of myrrh; and a sixth, five grains of aloes. In the two last the substances were dissolved; but in all the rest, the infusions were made in boiling water, and when cool, added to the bread and flesh beaten

to a pulp, as in the former experiments. Besides these, another phial with the common mixture was prepared for a standard, with which the rest were to be compared, in relation to the manner, time, and degree of their fermentation. Things being thus disposed, and the phials placed in the furnace, I observed the fermentation to begin in them all much later than in the standard, that with the saffrafas excepted; but with this difference among them, that the mixtures with the aromatics, especially that with the saffrafas, fermented strongly and generated more air than the standard, whilst those with the saffron, myrrh, and aloes, fermented slower, and were less flatulent.

3. In the same manner I examined the tops of wormwood and the lesser centaury, camomile-flowers, gentian-root, and green tea; making moderate infusions of all except the last, which was strong; and I perceived that these also retarded fermentation considerably; the camomile and wormwood most; and that all of them, like the former bitters, moderated the fermentation; though none of them nearly so much as the *saliva*.

4. I found the same effect in strained decoctions of the wild valerian-root, and of the *Peruvian* bark. But when the decoction of the last was left unstrained (*i. e.* with more of the substance in it) the fermentation became then much greater than in the standard. Whereupon recollecting

lecting the like high fermentation of saffrafras, and what is said of the fermentation of the *Thames*-water, in oaken casks *, I imputed these greater commotions to the aptness which all wood has to increase fermentation, when infused with any thing putrid. But however that may be, it is likely that this fermenting quality of the Bark is the cause of its disagreeing with weak stomachs, when taken in substance, and in large doses.

5. In like manner I examined horseradish, mustard-seed, and garden scurvygrafs, as specimens of the hot alkalescent plants, and observed that the first, like the bitters, suspended the fermentation long; the mustard, a little while; but the scurvygrafs, not at all. And I took notice, that these mixtures not only fermented more moderately than the standard, but also less than any of the substances before mentioned; and therein approached nearer to the nature of the *saliva* than any thing yet tried. Lastly, I observed both of the bitter and acrid plants, that after a complete fermentation, the acid thereby produced was sensibly milder than that in the standard.

* The great tendency in the *Thames*-water first to ferment, and then to become pure, in long voyages, is well known; and it is probable that this quality is owing to the extraordinary quantity of putrid matter with which it is impregnated at the place where it is taken up, viz. a little below *London*-bridge. As I have never heard of this, or of any other water, fermenting but in wooden vessels, we may conclude that a vegetable juice is a necessary ingredient. Oaken casks are particularly noted for promoting the fermentation of common vinous liquors.

From

From these experiments it seems probable, that spirits, acids, bitters, aromatics, and the hotter antiscorbutic plants retard fermentation by their power of correcting putrefaction; and that since putrefaction and fermentation are such requisites in digestion, whatever opposes those processes must be contrary to that action. But as by means either of putrid *saliva*, or from a defect of that humour, the aliment may ferment too strongly; or by a debility of the stomach, the food may be detained too long in it, and ferment too much, acids, bitters, aromatics, wines, &c. may have their several uses; some for checking immoderate fermentation, and others for bracing the stomach, and enabling it to expel its contents in due time.

Fermentation being wholly suppressed in the phials by small-beer, wine, and acids, may seem to prove that this process would not take place in the stomach during the free use of such liquors. But here we must observe, that the experiments mentioned were made without any *saliva*; for, when new trials were made with a sufficient quantity of that humour, the same materials then fermented well, and only somewhat later than in the standard. Again, when the putrid *saliva* was used, so far were the acids from being of disservice, that they were evidently useful in preventing the more violent fermentations which such mixtures would have produced.

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But whenever the recent *saliva* was overpowered by the acid, the fermentation was then to be promoted by correcting that acid, either by an alkaline salt, or by the testaceous powders.

All these facts correspond with digestion. For, the most nourishing and digestible food, to people in health, consists of a due mixture of animal and vegetable substances with water. Scorbutic or putrid habits require acids, wine, or other antiseptics. An acid abounding in the stomach is corrected by absorbents; and in a want of natural heat, or in a debility of the stomach, wines, bitters, warm and acrid substances become necessary for bracing and stimulating the fibres.

Since one great use of the *saliva* is to moderate fermentation, it is probable that such substances as resemble it most in this quality will prove the best stomachics, upon the failure of that humour. Of this class are acids, spirits, and bitters; but seeing that all these much retard, as well as moderate fermentation, they may be frequently less proper than some of the antiscorbutics, which, as we observed, stopped fermentation little, and yet kept it most within bounds*. And as to the aromatics, however assisting they may be in digestion by their heat and *stimulus*, they promise less of a carminative quality than either the bitters, or antiscorbutics, in as much as they

* Such as mustard, and garden scurvy-grass: see page lxxviii.

are more disposed to increase than to moderate fermentation, and consequently to produce air, instead of suppressing it.

EXPERIMENT XXXVIII.

BEING desirous of comparing the effects of bile with those of bitter plants, I made trials with fresh sheep's gall; but found the result very different from the common opinion, about the agreement between an animal and vegetable bitter. For, having added a portion of the gall to a mixture of flesh, bread and water, and made a standard of a like mixture without the gall, I perceived the fermentation begin in both about the same time, but to be much stronger, and more tumultuous in the former than in the latter. Nay, so little was the gall disposed to restrain fermentation, that without any other animal substance it fermented with bread and water only, as mentioned in a former paper. Now, since vegetable bitters are antiseptic, retarders, and moderators of fermentation, they must therefore influence digestion very differently from the bile, which is possessed of all the opposite qualities. This being the case, we cannot be surpris'd at finding digestion so little mended in the jaundice by bitters, which are commonly given to supply the defect of the gall. There is nevertheless one quality in which the animal and vegetable bitters may agree, *viz.* in correcting acidity;

acidity; for, I took notice, that though the bilious mixtures lost their usual rankness acquired in the beginning of the fermentation, yet they never smelled nor tasted sour after it had ceased.

EXPERIMENT XXXIX.

UPON adding sea-salt to the common mixture, I observed that the same quantity, which proved septic in the former experiments, made the fermentation begin sooner here than in the standard; but that a larger quantity retarded it. Thus two drachms of bread, with as much flesh, two ounces of water, and ten grains of sea-salt, fermented somewhat sooner than a like mixture without salt; but when the salt was increased to half a drachm, the fermentation came on later than usual.

But salt of wormwood, and ley of tartar, always retarded fermentation, and that in proportion to their quantity. I tried no other salt, being persuaded that all the rest (in any proportion) would resist fermentation, as being all thoroughly antiseptic.

EXPERIMENT XL.

A FEW grains of prepared crabs-eyes, added to the common mixture, brought on the fermentation above half an hour before the standard, and made it greater. The flesh

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also became ranker than usual; yet it was at last sweetened by the acid produced in this process. But when twenty or thirty grains of the powder were used, the fermentation came on still earlier, and was more violent; and the flesh becoming once putrid, never recovered its sweetness.

The effects of lime-water were different; as it neither hastened the fermentation, nor made it so strong as above; the motion however was brisk, and when it ceased, the liquor was neither acid nor putrid, but had an agreeable smell like that of new bread.

Thus the *testacea*, lime-water, and fixed alkaline salts agree in some things, but differ in others. For, both putrefaction and fermentation are resisted by the salts, but promoted by the *testacea*; whereas lime-water neither retards fermentation, like the lixivial salts, nor hastens it, nor makes it so violent as the *testacea* do; and being moreover somewhat astringent, it becomes a good medicine for weak stomachs with a predominating acid; as several have experienced who have been subject to the gout, gravel, and other chronic diseases seemingly depending on that cause.

EXPERIMENT XLI.

ALIMENTARY animal substances, tending to putrefaction, are all of them likewise promoters of fermentation,
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so far as I have inquired. Thus, meat kept till it is become tender, though still sweet, is a readier ferment than the same kind used quite fresh. But though the fermentation is by the keeping sooner excited, it is not made thereby the stronger. Flesh pounded in a mortar ferments much sooner, and with less tumult, than the same does in a lump, or not sufficiently bruised; and raw meat ferments more violently than roasted. All which are circumstances agreeable to common observation, viz. that meats are better digested when kept till they are tender, when well dressed, and sufficiently chewed; and seem to prove, that whatever is slow to corrupt, will *cæteris paribus* also sit heavy on the stomach.

Among animal substances eggs corrupt the most slowly, and of course are among the slowest to excite fermentation. Hence a new-laid egg, for its bulk, should be of all tender animal food the heaviest; and yet the same substance, by another theory respecting the nutrition of the chick only, has been thought the lightest of any.

PAPER VII.

Experiments and remarks upon the putrefaction of blood, and other animal substances. Of the nature of the inflammatory crust or the sily part of the blood. Of the fecal acid. Uses drawn from observing the colours of corrupted blood. Of the nature of purulent matter. The resolution of the blood, the relaxation of the fibres, and the emission of air, are the consequences of putrefaction: hence several symptoms of putrid diseases accounted for. The marrow not soon corruptible. The blood may become really putrid whilst the animal lives. The different effects of alkaline salts, and of putrid substances, upon the nerves. That there is properly but one species of the true scurvy; and that this arises from putrefaction.

Read Feb. 13, 1752. **H**AVING in my last paper finished that part of my subject which relates to the vinous fermentation of vegetables, excited by a putrid ferment, I shall conclude the whole with subjoining a few experiments made upon the putrefaction both of blood and of the more solid parts of the body, with a view to clear up some other points in the theory of medicine.

EXPERIMENT XLII.

A PORTION of blood, taken from a man ill of a pleurisy, was divided into the inflammatory crust *, the

* *Viz.* that part of the blood, which M. DE SENAC calls *la matiere blanche, qui se coagule d'elle même.* *Structure du Cœur, tome ii. p. 91.*

crassamentum,

crassamentum, and the *serum*. These were put into different phials of a larger size (so as to contain a good deal of air) and being corked, were placed in the furnace, heated to the common standard, viz. 100 degrees of *Fahrenheit's* thermometer. In twelve or fourteen hours the crust began to corrupt, the *crassamentum* held out a few hours longer, but the *serum* continued near four times longer than this last without any offensive mark of putrefaction. This experiment was repeated with some fresh pleuritic blood, taken from another person, and with the like success.

2. Another time, having procured blood with a thick inflammatory crust, I separated that part of it from the rest, and dividing it into two, I exposed one piece to the air, in a room; and the other I kept in a saucer, and covered it with a cup. The experiment was made in summer; and I observed that the former piece (which at first weighed two drachms) lost half of its weight in twenty-four hours, by evaporation only; and that in two days more, the whole was reduced to a thin pellicle; but that the covered portion, in a few days, ran *per deliquium*; whilst one part of the *crassamentum* (that had likewise been left to evaporate, but upon the outside of a window) formed itself into a thick cake; and the rest of that substance, which was kept in a close phial, retained for some weeks a considerable degree of cohesion.

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The inflammatory cruet being therefore so soluble, volatile, and corruptible, we may conclude that it contains a greater quantity of septic particles, than any other part of the blood. How this comes to pass, I shall now endeavour to explain.

Whether those inflammatory fevers are first brought on by the shutting up of the pores, or by some other cause, has been a question; though it has never been doubted, that a stoppage of perspiration is, at least, the consequence of such fevers; and therefore it follows, that in either case, the most corrupted particles must be retained, at a time when, from a greater degree of heat, the humours are most disposed to putrefaction. But when after bleeding, the blood is allowed to stand till the homogeneous parts have time to unite, the perspirable and septic matter immediately flies off from the *serum*, as least viscous; but adheres to the *crassamentum*; and is still more entangled in the fizy or glutinous portion of the blood that rises to the surface.

EXPERIMENT XLIII.

MINERAL acids being such powerful antiseptics, I was desirous to see their effects upon substances already putrid. For this purpose I dropped spirit of vitriol both upon a piece of corrupted beef, and upon the *crassamentum* of human blood, also putrid; and observed that this acid, instead of allaying the *fætor*, rather increased it; so that by
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this addition it became stercoraceous, or acquired such a smell as arises during the precipitation of sulphur (by an acid) in a lixivial *menstruum* *.

Having repeated the experiment both with the spirit of sea-salt, and vinegar, with the same result, we may from thence conjecture, that the *effluvia* issuing from corrupted substances consist chiefly of the *phlogiston* † or *sulphur-principle*; since these *effluvia* so readily unite with, and volatilize the acids, as appears by the increase and particular change of the smell. But it will be proper to remark, that from a simple putrid substance, the *phlogiston* does not rise alone, but combined with the saline parts of the body. For, the *phlogiston*, when single, is perhaps imperceptible to the smell; and when divested of these salts, is never, so far as we know, pestilential. So that the deleterious particles of rotten substances seem to consist of a certain combination of the sulphureous with the saline principle, which united not only become the most irritating *stimuli* to the nerves, but act upon the humours as a putrid ferment, in promoting their corruption.

* Sciendum vero sulphur solutum alcalicis, dein misto acido, præcipitari, albescere, *fæto*rem ingratissimum putrefactorum excrementorum exhibere... Si tincturæ aureæ sulphuris acetum instillas, mox *fætor* prodit *stercoreus* ex præcipitato sulphure. BOERHAAVE, Element. Chem. tom. ii. proc. clix,

† Materiam et principium ignis, non ipsum ignem, ego *phlogiston* appellari cœpi; nempe primum ignescibile, inflammabile, directè atque eminenter ad calorem suscipiendum atque fovendum habile principium STAHLII Fundam Theor. BECCHERIAN.

From the same experiment it likewise seems probable that the *fæces humanæ*, to which this mixture (made between a putrid substance and an acid) has a near affinity, are compounded of some strong acid and corrupted matter; and from thence, that, in a natural state, the *fæces* are little, if at all, infectious: which could not happen, were they wholly putrid*.

EXPERIMENT XLIV.

AFTER the acid was added, in the manner described in the last experiment, I attempted to restore those substances to their former putrid state, by an alkaline salt. But upon infilling the ley of *tartar* (which was followed by the usual effervescence) I perceived that the mixture became thereby much less offensive, than when the putrid substance was either alone, or joined to the acid: a circumstance which I did not expect. But from hence, perhaps, we may be able to account for the virtues of the saline draughts of *Riverius*, taken in the act of effervescence, and first recommended by that author in vomitings incident to putrid and malignant fevers†.

EXPERIMENT XLV.

IN order to examine the colour of the different parts of corrupted blood, I procured a fresh quantity without any

* See the preceding Observations, part iii. ch. vii.

† RIVER. cap. de Feb. Pestilent.

inflam-

inflammatory crust, and divided it into the *crassamentum*, the *serum*, with a few red globules that fell to the bottom, and the pure *serum*. The phials containing these several liquors were set in the furnace, where they stood some days till they became thoroughly putrid.

The *crassamentum* changed from a deep crimson to a dark livid colour; so that when any portion of this was diluted with water, it appeared of a tawny hue. Of the same colour was that *serum* in which the red globules had been dissolved. But the pure *serum*, after becoming turbid, dropped a white purulent sediment, and changed into a faint olive-green.

From this experiment it should seem, that the *ichor* of sores, and that of dysenteric fluxes, consists of the *serum* tinged with a small quantity of red blood putrefied; and that when the ferous vessels are of a tawny cast, we are not always to refer that colour to inflammation, but to a solution of some of the red globules mixed with the *serum*. An instance of which may be seen in the colour of the *white* of the eye in putrid scurvies, and in the advanced state of malignant fevers. At such times not only the *serum* of the blood drawn from a vein, and what oozes from a blister, but even the *saliva* and sweat will be tinged in the like manner*.

* See the preceding Observations, page 197.

To the recent urine of a person in health were added a few drops of this putrid *crassamentum*, which it immediately changed into a flame-coloured water, so common in fevers and in the sea-scurvy. After standing an hour or two it gathered a cloud, resembling what is seen in the crude urine of acute distempers; and I took notice of a speck or two of an oily substance on the surface, like that scum which is said to appear in putrid scurvies.

As to a green *serum*, it is perhaps never to be seen in the vessels of a living body; since in all putrid disorders the red globules being resolved, enter the ferous vessels, and when the *serum* is thus coloured, it never can become green. Besides, as this humour is very late in acquiring that cast when out of the body, it is not to be supposed that a person could survive so great a change of the blood. But in dead bodies this *serum* is to be distinguished by the greenness which the flesh acquires in corrupting. In salted meats we commonly ascribe the greenness to the brine, but erroneously; for salt has no power of giving this colour, but only of qualifying the taste, and correcting the bad effects of corrupted aliments, in some degree. This colour in dead bodies begins first in the intestines, and in the parts adjoining, from the air in the *primæ viæ*, which hastens the putrefaction.

In foul ulcers, and in other sores where the *serum* is left to stagnate long, the matter is likewise found greenish,
and

and it is then always acrimonious. But the effects of a green *serum* are no where so much to be dreaded as in the case of an *ascites*, where it is often collected in a large quantity. Of this the Society had, some years ago, an instance, almost fatal, in Mr. Cox, surgeon at *Peterborough*; who upon tapping a woman, but a few hours after her death, was so affected with the poisonous steams of a green *serum*, that he was presently seized with a pestilential fever, and narrowly escaped with his life*.

I have already observed that the *serum* of human blood, upon standing but a little time in the furnace, becomes turbid before it grows offensive, and then gradually drops a sediment resembling digested matter. This experiment was also frequently repeated with the same success; and I likewise took notice, that this matter never changed its colour, or mixed again with the *serum*. From these circumstances I conjecture, that this sediment is a terrestrial substance, intended for the nourishment or reparation of the solids. And I am the more inclined to this opinion, upon discovering a like sediment in the urine of people in perfect health, after long standing, as I consider this last as either the redundance of the nutritious matter, or what has been actually applied, but ceases to be of any longer use.

We may therefore conclude, that the *serum* is perpetually oozing into all ulcers; but that from the heat of the

* *Philos. Transact.* n. 454. p. 168. *Abridg.* vol. ix. part iii. ch. v. art. viii.

part, and the natural volatility of animal fluids, it is all quickly evaporated, excepting this matter that remains in the fore in the form of *pus*, which is so requisite to the cure. For this reason all large ulcers are so weakening, from the great expence of blood in furnishing as much *serum* as is necessary, upon evaporation, to leave a sufficient quantity of this substance: and hence it is that issues are of more consequence for making drains, than one would expect from the visible discharge. As near as I could guess, an ounce of *serum*, upon standing some days, did not furnish more of this matter, than what might be produced by the daily running of a common pea-issue, or of a seton.

EXPERIMENT XLVI.

As all the humours become thinner by putrefaction, so the solid or fibrous parts of animal bodies are relaxed or rendered more tender by the same process. This observation is so common and uncontroverted that it requires no new experiments to confirm it. I shall therefore only remark, that this state seems to be one of the clearest cases of diseases depending on weak and lax fibres, as it appears in all malignant fevers, and in the true sea or marsh-scurvies which arise from a putrid cause.

From this circumstance we are enabled to account for the extraordinary bulk of the heart, liver, and spleen,
the

the common effects of these diseases. For, supposing the natural growth of the parts stopped by the rigidity of the fibres balancing the distending force of the blood, it will follow, that whenever the fibres are preternaturally softened, the increase of the same parts will begin again *. Of this fact, we have some remarkable instances in those who died of the last plague at *Marseilles* (communicated to the Society by M. *Deidier*, one of the physicians to the King of *France* †) which, with others of the same sort, have been since republished in a large collection of papers relating to that fatal distemper ‡. It is observable, that in nine dissections there referred to, the extraordinary growth of the heart is mentioned in all, and that of the liver in seven of them. Thus, in the first, the author takes notice: “ That the heart was of an extraordinary bigness, and the liver was of double the natural size....Case 2. The heart was of a prodigious bigness, the liver much enlarged....Case 3. The heart of double the natural bigness....Case 4. The heart was very large, and the liver was bigger and harder than ordinary....Case 5. We found the heart of a prodigious bigness....Case 6. The heart was larger than in its natural state, the liver also was very large....Case 7. The heart was of a prodigious size, and the liver was very

* This conjecture I had from Dr. SIMSON, professor of medicine in the university of St. *Andrews*.

† *Phil. Transact.* n. 370. abridg. vol. vi. part iii. ch. ii.

‡ *Traité de la Peste*.

“ large....Case 8. We found the heart much larger than
 “ natural, and the liver of a prodigious size....Case 9. The
 “ heart was double the natural bigness, and the liver
 “ also was larger than ordinary.”

As to the scurvy, *Eugalenus*, a noted author on that disease, observes that the liver and spleen were often so much enlarged that the tumour could be seen outwardly *. And *M. Poupart*, who opened a great number of those who died of that distemper, remarks, that in all those who died suddenly, he found the auricles of the heart as large as a man's fist, and full of coagulated blood †.

With regard to the corruption of dead bodies, a skilful anatomist, who has made an uncommon number of dissections, informed me: “ That the *viscera* and muscles
 “ of the *abdomen* corrupt sooner than any other part of the
 “ body after death; therefore it is a rule with anatomi-
 “ sts to begin their dissections and demonstrations with
 “ those parts which first become offensive. That the quick
 “ putrefaction here may be ascribed to the air included in
 “ the intestines, or to the putrid steams of the *feces*, espe-
 “ cially in a morbid state: hence also the speedy corrup-
 “ tion of the muscles *psoas*, and *iliacus internus*, in compa-
 “ rison of the muscles of the extremities. That next to

* Lib. de Morbo Scorbuto art. xxxi. Conf. MEAD Mon. & Præc. Med. cap. xvi.

† Mem. de l'Acad. R. des Sc. A. 1699.

“ the abdominal *viscera* and adjacent parts, the lungs are
“ commonly the soonest tainted; whether from the air
“ stagnating in the *vesicule bronchiales*, or some remains of
“ the perspirable matter, that may act as a ferment and
“ hasten the putrefaction. For, whoever tries the experi-
“ ment of compressing the *thorax*, in a body that has been
“ dead for some time, will be sensible of the putrid state
“ of the lungs, by the offensiveness of the air that is for-
“ ced out of them. That the brain ought to be dissected
“ as soon as can be conveniently done after death; be-
“ cause in its firmest state, it is but an indifferent subject
“ for the knife, and altogether unfit for dissection when
“ resolved by putrefaction; but that in several cases it
“ had been found unexpectedly firm after being kept
“ some time, and as sweet as any other part of the body.
“ Lastly, that this difference is observable between the
“ brain and the other parts, that when the brain is kept
“ in the open air, its putrefaction seems thereby rather
“ retarded, and it acquires a dry glossy skin on its outside;
“ whereas all the other parts corrupt manifestly the sooner
“ for being exposed to the air, and get a covering of a
“ putrid *mucus* all over their surface*.”

EXPERIMENT XLVII.

THE marrow is commonly accounted a substance the most offensive when corrupted; perhaps for this reason

* Dr. HUNTER, who favoured me with this account, added, that as he had never given a particular attention to this subject, he could only offer what is above as the result of his best recollection.

only,

only, that carious bones are more fetid than other sores. But however that may be, I am apt to think, from the following experiment, that in general the marrow must putrefy very slowly. I put an equal, but a small quantity of ox's marrow into two large phials; to one of which I added prepared crabs-eyes. These phials being corked were set by a fire, kept up all the day to a heat sufficient for liquefying the marrow (that is, above the hundredth degree of *Fahrenheit's* scale) and continued there near five weeks. Yet at the end of this time I could perceive nothing offensive in the phial with the pure marrow, and the other smelled only a little rancid.

From this experiment, one should believe that the *fætor* of a carious bone is not to be attributed to the marrow, since the corruption of that substance tends more to the rancid than to the cadaverous smell; and therefore I am inclined to refer that rankness to one of the two following causes, or to a combination of them. The first may be the porousness of the bone, which retains the corrupted matter longer than any ordinary sore. The second, the more constant oozing of vessels conveying the red blood; for, when these are broken in a boney substance, they do not contract so soon as in a common ulcer; and we have seen that the red part of the blood admits of a higher degree of corruption than the serous.

EXPERIMENT XLVIII.

It is well known that as flesh, so the blood is specifically heavier than water; and that dead bodies float, after lying some time at the bottom, by means of the fixed air separated in the bowels by putrefaction. But I have observed that a bit of meat beaten in a mortar to the consistence of a pulp, put into a phial with water, and set in the furnace (as in the foregoing experiments) after remaining a few hours at the bottom, floated before it became offensive; though after it rose, the corruption was soon perceptible. Here it is probable, that the particles of air, incorporated with the animal substance*, begin to be disengaged, and to be so collected together as to buoy up the flesh, though at this time there are scarce any air-bubbles to be seen with the naked eye adhering to it.

Further, I have remarked that both the *crassamentum* and the *serum* of human blood have yielded air, after standing some time in the lamp-furnace, before they smelled offensively. This was easily discovered by the accumulation of air in the phials; for in that heat, the inclosed air, where there is no animal substance, is scarce sensibly dilated.

But upon the thorough putrefaction of all animal substances a considerable quantity of air is generated;

* HALE'S Veget. Stat. ch. vi.

which being a fact sufficiently known, I need only add, that I have constantly observed a great deal more air produced from flesh than from blood, and that this too is a circumstance agreeable to the experiments of Dr. *Hales**.

Now, as I could be assured that the blood and other animal substances, at the time they began to emit air, were not so far advanced in the septic process, as they are often found in some putrid diseases, I was induced to think that several symptoms in a deep scurvy† might be owing to the action of the air, within the vessels, either wholly detached from the humours, or but imperfectly incorporated with them; though I was aware of an objection that might arise from the experiment of injecting air into the veins, by which animals are said to die immediately with convulsions. For, all that we can infer from thence is, that more air is thrown in than is consistent with the circulation; and that if there was less of it, the animals might survive, though perhaps not without some irregular motion of the blood, faintings, a palsy, or other affections of the nerves, according to the quantity of the air injected. In fact, we find some of the most accurate naturalists allowing, after trial, that air may be conveyed into the veins slowly, and in a small quantity,

* Vide loc. cit.

† By the *scurvy*, I always mean the disease of sailors, or of those who live in a moist air, eat salted provisions, have little milk or greens, and drink no fermented liquors.

without

without killing the animal *. And this is further confirmed by the experiments made upon animals inclosed in an exhausted receiver, which swell all over, and are thrown into convulsions, as soon as the air is withdrawn, yet recover upon the timely re-admission of it †.

Have not therefore the symptoms of a deep scurvy some similitude to what these animals suffer? For, we are told by those who have had opportunities of seeing the worst cases, that the sick are afflicted with vague and excruciating pains, coming on and going off suddenly, which are always rendered worse by bleeding ‡; that they have tumours appearing in several parts of the body, different from all others §; and that they are subject to sudden and momentary numbness of their limbs, to convulsions,

* Vena nempe jugularis vivi canis inflatur, protinus coagulatur sanguis, et citâ mors sequitur liberum aëris per sanguinem iter. Sed et paucò aëre injecto, neque necatis animalibus, pulsus intermittens fit. (REDI vol. vi. p. 223.) Respondit dudum BERGERUS, posse bullas magnas aëris frigore suo coagulare sanguinem, et immeabilitate obstruere vias; neque ideo aëris minimas particulas, sensim et parvè admittas eadem mala facturas. HALLER. Not. in BOERH. Prælect. Physiolog. vol. ii. p. 208.

† BOYLE Physico-Mechan. Exp. *Mem. de l'Acad. R. des Sc. A.* 1700, 1707, MUSSCHENBROEK *Inst. Physic.* § 1388.

‡ EUGALEN. de Morb. Scorbut. art. xii. et seq. art. xxx.

§ *Id ibid. art. xviii.* M. POUPART also observes, that in one year a great number of sick being sent into the *Hotel-Dieu* with some alarming symptoms, he had inquired into the nature of their ailment, and found that it was only the scurvy, but in a more than ordinary degree. Among other appearances, he observes that several had such large swellings over their body and in their extremities, that they looked as if they had been blown up. *Mem. de l'Acad. R. des Sciences, A.* 1697.

and to palsies of an uncommon kind*. To all which let me add the effects of the quick changes of the weight of the atmosphere, which being perhaps more remarkable upon constitutions of this kind than upon any other, seem to confirm what has been conjectured about the looser connexion of the air with the blood, in scorbutic habits.

Lastly, it may be proper to remove the difficulties of those who maintain, that no animal can live whilst the blood is really putrid, and therefore that the most that can be allowed, is only a tendency to putrefaction. But to this we reply, that besides numberless observations of the corruption of all the secretions, as well as excretions, in diseases, we have frequent instances of the tawny colour of the *serum*, the resolution of the *crassamentum*, and even of the offensive smell of the blood recently drawn †.

* EUGALEN. art. xi. xxvi. xxvii.

† Vapor, ex sanguine exhalans, est mitis, blandus, neque nares neque oculos afficiens; in statu tamen præternaturali planè eodem modo, ut sudor morbificus et vapor ex ulcere manans atque evaporans, acer nares atque oculos ferit. SCHWENCKE Hæmatolog. p. 90.

In morbis putridis, dissolutio cruoris quoque advertitur, præsertim pestis specie, in quibus non coagulatur sanguis (scil. e venâ emissus) sed gangrænosus et putridus reperitur; quod etiam in eo sanguine observatur, qui post protractam inediam putridus et alcalinus factus est, &c. Id. ibid. p. 129.

Sanguis qui per febres putridas detrahitur sæpe animadvertitur non solum foetidus & graveolens, sed et putridus; adeò ut nec sibi cohærere nec concrefcere queat, omnibus scilicet ejus fibris putredine consumptis. FERNEL. de Febr. cap. v.

Denique notatu dignissimum est, quod mihi nuperrimè videre contigit, sanguis foeminæ cujusdam, febre malignâ laborantis, per phlebotomiam detractus adeò foetebat, ut ex ejus tetro odore tam chirurgus quam adstantes in animi planè deliquium inciderint. MORTON. Pyretolog. part. i.

And

And indeed if we reflect how putrescent blood is in a heat equal to that of the human body, we may be convinced that the perspiration by the lungs and skin (or whatever other outlet there may be for the more volatile and corrupted particles) is no sooner impeded, than a *resolution* begins in the whole mass, which if not timely prevented brings on some putrid disease *.

If the acrimony be great, and the nerves thereby suddenly affected, a putrid fever, a vomiting, or a flux will ensue. But if the accumulation be so slow, that the nerves grow in some manner habituated to the putrefaction, a scurvy prevails. This is the case not only of sailors, but of all others, when milk, greens, and fermented liquors are wanting, and when the greatest part of the diet consists of meats long salted, which, though rendered palatable by the salt, are in effect putrid. Whatever accident, in such circumstances, tends to stop perspiration, is apt to increase the disorder, and especially if the moisture of the air concurs with such unwholesome aliment.

* It has been the opinion of some physiologists, that the blood is kept from putrefaction by its motion only; but for this they assign no other reason, than their observing the greater purity of running water, and of the sea when agitated by the wind, in comparison of the same when stagnating. But here, as motion seems only to be the accidental cause, by furnishing means to the water for exhaling its more corrupted particles, so in like manner the circulation can only enable the blood to throw off such matter as would corrupt it, if retained too long in the vessels.

† See exper. xlv. and Observ. part iii. ch. vii.

Now

Now, instances of this sort are so common, that it may seem strange how the corruption of the humours should ever have been contradicted; and indeed for this I can only assign the following reason. By some mistake of the chemists, the notion of the putrefying principle, in animal substances, was confounded with that of an alkaline salt, which salt being looked upon as corrosive, they concluded that as it could not enter the vessels without destroying both them and the nerves, so the blood could never be supposed alkaline or putrid whilst the person lived. But from several of these experiments we find, that putrid substances are very different from alkaline. I have frequently given of the salt of hartshorn a drachm a day, for a continuance, without observing any septic effects; and since the introduction of Mrs. *Stephens's* medicine for the stone, we see what large quantities of the fixed alkaline salts may pass into the blood without doing any harm. So different therefore are these salts from putrid matter, that of all stimulating medicines they are perhaps the least hurtful to the nerves and the vessels; whilst every corrupted animal substance is not only offensive to the senses, but to the whole nervous system, as is evident from the *nausea*, spasms, palpitations, tremors, dejection of spirits, and other symptoms consequent upon the admission of any strong septic ferment into the blood.

It will appear that in these papers I have considered the scurvy as arising from a putrid cause only, without regarding

garding whether that putrefaction be owing to corrupted provisions at sea, or to the want of proper diet in marshy countries. For, by not confining the scurvy in this manner, some writers of the first rank have confounded several diseases under that name, though different in their cause, their symptoms and their cure. I cannot, for instance, see what relation the various kinds of scurfs and tetter (which are *species* of the leprosy) have to the disease of sailors; or how those who admit of putrefaction for one cause of the scurvy, should at the same time acknowledge an acid acrimony for another. It would seem that they were led into this last inconsistency by observing how serviceable the *raphanus rusticus*, the *cochlearia*, and the like plants were in the cure. For, as all these were reputed of an alkaline or putrefying nature, an acid *species* of scurvy seems to have been invented in order to account for their virtues. But from the experiments laid before the Society it appears, that these vegetables are real antiseptics*, and therefore possessed of qualities very different from what those celebrated authors imagined, when they considered their alkaline parts as septic, and their resolution as tending to putrefaction only, and not to fermentation.

* Exper. xi. xx. xxv. xxxviii. 5.



A N
A N S W E R
T O

PROFESSOR DE HAEN

AND TO

M. G A B E R,

Concerning some remarks made by them on the
preceding work.

I. **W**HILST the third edition of my Observations was in the press, I met with a treatise on fevers *, published by Dr. *de Haen*, professor of medicine in the university of *Vienna*. Upon perusal, I was a little surprised at observing, that the learned author, in his section *de Febre Miliari*, after finding fault with Dr. *Huxham's* sentiments and practice in regard to that fever, should add, “ that if, in opposition to his own opinion, any thing were
“ advanced from my writings similar to what he had con-
“ demned in Dr. *Huxham's*, the same arguments which he
“ had used against him would serve against me.”

* The title is *Theses Sistentes Februm Divisiones*, &c.

Now,

Now, if either Dr. *Huxham* had copied from me, or I from him, or indeed had there been an exact conformity between us, this short remark might have been sufficient; but as none of these circumstances are true, Dr. *de Haen* will, I hope, excuse me for shewing some of his mistakes on this occasion, so far as I am concerned: for as to what relates to Dr. *Huxham*, as I am satisfied he is well able to answer for himself, I shall leave him to say what he thinks proper upon the subject.

For my part, I have been so far from proposing any opinion about the nature of a miliary fever, or the method of treating it, that I have never mentioned the distemper but in the most transient manner. Once, in order to distinguish the pustules peculiar to it, from those of the itch; in another place, to distinguish those pustules from the *petechiæ* (where I have expressly added, that the miliary fever was not to be confounded with the hospital-fever*;) again, when I observe that I never saw the hospital-fever accompanied with miliary pustules †; and lastly, when I say, that the miliary fever is a rare disease in the hospitals of an army ‡. Hence it will appear, that I have never considered the hospital-fever and miliary fever as similar diseases: and indeed I may venture to affirm, that as no

* Observat. on the Dis. of the Army 1st edition p. 302. present edition p. 296.

† Ib. 1st ed. p. 358. present ed. p. 339.

‡ Ib. 1st ed. p. 359. present ed. p. 341.

two species of fevers can be more unlike, so neither the theory nor the practice in the one can be regulated by analogy from the other.

But Dr. *de Haen* insists on a near relation between the miliary and the petechial fever*; and as he will have that malignant fever which I treat of, to be the same with his petechial fever; he thinks proper, in his section on the miliary fever, from principles relative only to that disorder, to reflect upon my practice in one of a very different kind.

The malignant fever, which I saw, is not the *febris petechialis*; for I have remarked, that though the eruptions, which I call the *petechiæ*, often appear in the jail or hospital fever, yet they do not constantly accompany it, and therefore have not a title to characterize that disorder any more than the plague, of which likewise they are a frequent symptom. This distinction between a petechial fever, and a fever sometimes attended with *petechiæ*, not apprehended by Dr. *de Haen*, is well laid down by *Sennertus* in his account of the *morbis Hungaricus*, which, as I have elsewhere observed, was a camp-fever raised to a high pitch of malignity. His words are, *Nonnulli morbum Hun-*

* At the conclusion of his section *de Febre Petechiali*, he says, *Multa de Petechiis dicenda supersunt; maxime de iisdem tum præveniendis, antequam fiant; tum, cum adsint, curandis. Verum cum hæc quoque ad Miliarem eruptionem pertineant, ipsaque Miliarium historia eam Petechiarum elucidet, atque explanet, unâ fideiâ hunc utrumque parietem dealbabo.*

*garicum et febrem petechialem planè pro eodem morbo habent ; sed mihi quidem videtur, non satis rectè. Etsi enim petechiæ et maculæ illæ quandoque etiam in morbo Hungarico conspiciantur, tamen non semper id accidit, et potest hic morbus esse sine maculis. Contra verò maculæ in febre petechiali omni inveniuntur ; unde et nomen hæc febris habet *.*

I have therefore all along considered the hospital or jail-distemper (in regard to others that commonly occur in these parts) as a fever *sui generis*, at least as different from either the mere inflammatory, the miliary, or other eruptive fevers which are known here. And indeed, unless at the times mentioned in my treatise, I never met with such a disease ; and I believe that some learned and experienced physicians of this place, employed for those who were taken ill of the jail-fever (at the Sessions held at the *Old-Bailey*, in the year 1750) had, from the mortality attending it, too good reason to believe that this disorder was not to be treated in the same manner either with the miliary fever, or any other which they had been conversant with before †.

One great cause of Dr. *de Haen's* mistake, and the confusion of other authors in treating of these fevers, may be the undetermined meaning of the word *petechiæ* ; and indeed the ambiguity here is such, that I must regret my

* De Febr. lib. iv. cap. xiv.

† See the account of it in the preceding Observations part iii. ch. vii. § 6.

having at all used the term, and my not being satisfied with barely describing the eruption, without giving it any name. Nor do the terms *lenticulae* and *puncticulae*, given by *Fracastorius*, afford a just idea of the spots which I constantly saw; or if with others we use the expression *morbus pulicaris*, the only resemblance will be in the colour of those spots to the bites of fleas, though these last are always redder*. *Febris purpurata* is not more proper; because the purple colour I have but seldom seen, and that chiefly when there were large blotches, *plagae* or streaks of a considerable length upon the skin. *Diemerbroeck*, upon the plague, says that the mortification in the *petechiae* reaches from the skin to the *periosteum*; where it is plain, that he can only understand such purple spots as are seen in the bad small-pox, scattered here and there, and not such an efflorescence as appears in the jail-fever, often covering the whole trunk, arms and legs, so thick that at a little distance the interstices can scarce be discerned. Dr. *de Haen* says that in the German language the *petechiae* are called *pfefferkorn*, (pepper-corn) on account of their round figure; and in another place, he defines them *punctula rubra, aut cinerea, aut purpurea, aut livida, aut nigra*. But I have never seen those small spots of any regular figure, nor of the color *cinereus*; at least, if he means the colour of

* As these fevers are chiefly seen among the lower people, I have suspected that the real bites of fleas have sometimes been taken for these morbid spots, and that from this mistake so many common fevers have been called *petechial*.

wood-ashes. Nor did I ever see them black, or purple, though the large streaks and *vibices* have much of that cast. Possibly the hot stoves, and unventilated apartments so common among the lower people in *Germany*, may sometimes change the ordinary fevers into one of a spotted kind, which he calls petechial. And I am the rather inclined so to think, as I have scarce met with a physician here (who had not attended the army, or the sick in jails) who could satisfy me that he had ever seen in any fever, either such an efflorescence as I mean, or such as Dr. *de Haen* describes, either in his private practice, or in the hospitals of this city. For my part, unless in the circumstances which I have mentioned, I do not remember to have observed such an eruption in any fever, in whatever manner it had been treated; nor indeed in any other disease, except twice in bad cases of the *lues venerea*, when the patients were otherwise feverish. Nor have I found in any author this eruption so defined, that I could reckon it quite the same with that which I describe. Dr. *Huxham* indeed, who during the former war had opportunities of seeing this malignant fever at *Plymouth* (whilst the jails were crowded with *French* prisoners, and the hospitals with our own sailors) observes, in his chapter on putrid, malignant and petechial fevers, "that the skin looked sometimes as if it had been marbled or variegated with a colour like that of the measles, but more dull and lurid." This is the thing which I always saw. But as the learned
author

APPENDIX.

author likewise mentions the *petechiæ* as something different from this *variegation* of the skin, I can only conjecture that he meant the same eruption, but called it *petechial* when the spots were single, and more distinctly seen.

I consider these spots, which I have called *petechiæ*, to be the effusions of the *serum*, tinged with some red blood (which being resolved by putrefaction, is enabled to enter into the ferous vessels) and that these effusions are made in the *cryptæ* or cells of the *cutis vera*; which cells are smaller, but similar to those of the cellular membrane, of which, according to the best anatomists, the skin is formed*. And perhaps it is owing to the closer texture of the skin of the face, that such effusions so seldom make their appearance there. As to the *vibices* or streaks of a more purple cast, I suspect them to be owing to similar extravasations, where the fine vessels of the *cutis* made tender by putrefaction have given way, when the patient, by accident, has scratched himself: for I have sometimes observed the streaks so long and so parallel to one another, that I could not help thinking they were produced in this manner by the fingers †.

My

* HALLER. Prim. Lin. Physiol. § ccccxiv.

† Dr. DE HAEN says, *Nec sola macularum sedes cuticula est*, &c. p. 33. where he does not mention the true skin at all, as the seat of the *petechiæ*, but the *cuticula*; which I wonder at, seeing the scarf-skin having neither cells nor vessels, so far as we know, is not susceptible of an inflammatory colour: nor can the effusions be made between the *cutis vera* and the *cuticula*, without pustules, or some elevations of the latter, which

My reason for calling these spots *petechiæ* was, because *Fracaſtorius* and ſome of the older authors gave certain names to eruptions in fevers from a putrid cauſe, which names were afterwards changed to this appellation. I am perſuaded, that if Dr. *de Haen* had ever had an opportunity of ſeeing ſuch fevers as I have been converſant with, bred in jails, or in the hospitals of the army, and had attended to the eruption peculiar to them, he never would have ranked that *ſpecies* with the miliary fever, to which it has no more reſemblance than to the ſmall-pox. The miliary fever is incident to all ranks of people, living in the beſt air, and in the moſt cleanly manner; whereas the malignant fever, which I treat of, is ſcarce to be ſeen but among the loweſt people, crouded together in cloſe and foul places, ſuch as in military hospitals, jails, and tranſport-ſhips.

Dr. *de Haen* allows, on the authority of *Sydenham* and others, “ that the *petechiæ* may be conſidered as critical in

which I never ſaw with that eruption. Further, I obſerve that Dr. DE HAEN joins with thoſe authors, who contend for the ſeat of the *petechiæ* being likewise in the fat, and in the fleſh, and does not diſſent from DIEMERBROECK, who imagined that he could trace them from the *periosteum*, where from a broad baſe they tapered all the way to the ſkin. Now, if DIEMERBROECK found theſe pyramidal ſubſtances mortified, what muſt be the mortification of the body at the root of our *petechiæ*, when their points almoſt cover the ſkin? And even then the patient may not only recover, but is liable to no ſeparation of parts, as in a true gangrene. It is therefore plain, that either DIEMERBROECK muſt have been miſtaken, or that his *petechiæ* were very different from thoſe deſcribed by me, and by Dr. DE HAEN too.

“ the

“the pestilential fever;” but adds, “that even in the plague itself, this eruption would seldom take place, were the antiphlogistic method of *Botallus* and *Sydenham* strictly followed*.” If so, what must he then think of the *petechiæ* in times not pestilential, such as ours? The author plainly tells us what he thinks, by applying to the present *German* physicians the censure which *Sydenham* passes upon his own contemporaries, viz. their converting, by means of “the *regimen calidissimum*, common fevers “into the *petechial* and *miliary* †.” As to the latter, in particular, though he concludes (from *Sydenham*) *Miliaria exanthemata frequentius malâ arte progigni, sponte longè rariùs ‡*, yet, in another place, he pretty plainly insinuates, as if that eruption would never be seen at all under proper management; if so we may judge by the following passage, *Liceatne id addere, quod et medici complures et ego in nosocomio, sive in vigore morborum, sive eorundem in fine, nunquam nostris in ægrîs, quibus a principio affuëramus arbitri, miliaria deteximus §*. Now, as some of our writers have taken notice of the spontaneous eruption of the *miliary* pustules, the authority of this learned person may influence such are as unacquainted with our practice, to believe, that if the regimen which we use were not too hot, we should not be troubled with this symptom.

In justice therefore to the country, as well as to myself, I must observe that to whatever excess the hot regi-

* *Theses*, p. 35.

† *Ib.* p. 35, 36.

‡ *Ib.* p. 68.

§ *Ib.* p. 66, 67.

men was carried in Sydenham's time (and I believe the excess was great) or whatever may still be the sentiments of a few amongst us, the general practice is at present very different. In the beginning of most fevers we bleed, keep the body open and cool, temper diaphoretics with nitre and other medicines of that kind; we give acids, diluting liquors, and recommend a free air; yet in certain seasons, miliary eruptions will appear, and (contrary to Dr. de Haen's sentiments) will often relieve the patient; nay sometimes prove wholly critical. And as to the jail or hospital-fever, I can still more freely aver, that the *petechie* accompanying it were not the effects of a hot regimen; but on the contrary, that these *exanthemata* were never more apt to appear, than when the patient was largely blooded in the beginning, and in the advanced state took nothing cordial. Indeed this is not to be wondered at, if these spots, being the effects of putrefaction, should be most readily produced when the vital powers are at the lowest. Thus, sometimes they did not come out till the last agonies, or even till after death itself; whereas the small-pox, measles, scarlet efflorescence, *erysipelas*, and miliary pustules, being more of an inflammatory nature, and attended with some kind of tumour, are most conspicuous when the circulation is strong; and, on the other hand, generally subside, or even disappear before death. I shall add, that in common fevers I have never seen any such spots upon forcing sweats, or using

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any warm regimen; which seems to be a proof of a specific difference between the petechial and the military eruptions.

Nor does Dr. *de Haen* sufficiently attend to what *Sydenham* says on the subject of the *petechiæ*. For, though *Sydenham* ascribes them, for the most part, to too hot a regimen, yet he acknowledges that they come out spontaneously in the plague and in the confluent small-pox*: and I have endeavoured to shew that the jail or hospital-fever belongs to the pestilential class of diseases. Even Dr. *de Haen* describes his *petechiæ* in such a manner, as would make *Diemerbroeck* and *Riverius* consider them as pestilential. *Sydenham* indeed believes that those *petechiæ*, which he mentions, depend upon a high degree of inflammation, but he does not prove it; and I should think it more probable that they are the effect of blood resolved by putrefaction; a principle which *Sydenham* does not seem to be acquainted with. As to their being rarely critical, I shall venture to go beyond both *Sydenham* and *de Haen*, and say, that even in the plague itself, I much doubt whether they are more critical than in the fever of jails or hospitals, where indeed they never are so.

Lastly, as to the hot regimen in the military and petechial fever (for which Dr. *de Haen* blames Dr. *Huxham*, and

* *Rarò sponte sua efflorescunt, præterquam sub adventu pestis ipsius, atque in initio variolarum istarum confluentium, quæ summæ inflammationis participes sunt.* SYDENH. *Schedul. Monitor.*

me through him) it must be clear how little I am concerned, when it appears, that I do not at all meddle with the miliary fever; and how probable it is, that Dr. de Haen's petechial fever is different from that of our hospital. But granting them to be the same, the author ought to have observed, that the regimen which I prescribe is far from being hot throughout. Sweating, I indeed advise upon the first symptoms, in order to prevent the fever; but I promote that sweat by mild sudorifics. Half a drachm of *theriaca*, with ten grains of salt of hartshorn, once in four and twenty hours, washed down with vinegar-whey, to a soldier lying in a bed without curtains, and often in a cold ward, is no such heating medicine as may be imagined. And as I am convinced, that in my own case I have more than once prevented this fever by sweating (when I had reason to believe I had taken the infection) I must recommend that practice to others which I found so beneficial to myself; though I must own, that as I am easily thrown into a sweat, my sudorific was no hotter than spirit of hartshorn with vinegar-whey, or the *Spiritus Mindereri* in a draught of some diluting liquor. When the fever was formed, the patient took the same medicines as in inflammatory cases; and I never prescribed the hot course, if so it must be called, till his pulse sunk and his strength failed; still attentive so to moderate this new regimen (which consisted chiefly of wine) as never to increase the feverish heat, much less to force a sweat; or to hasten any other crisis

before the natural period of the fever. I have expressly said in all the former editions, as well as in the present: “ I
 “ have observed that a *delirium* would arise from two op-
 “ posite errors; one, from large and repeated bleedings;
 “ and the other, from wine and the warm cordial medicines
 “ given too early; it appears therefore how nice the prin-
 “ ciples are that regard the cure; thus, neither a hot nor a
 “ cool regimen will answer with every patient, nor with
 “ every state of the disease *.”

Dr. *de Haen* might likewise have taken notice, how anxiously I recommend a free circulation of air; which perhaps none of his pupils would believe after he makes the following exclamation: *Quam sapiebant præ nobis Antiqui! Videte apud Cælium Aurelium Methodicos, calidis in morbis, in id præcipue intentos, ut cubiculum et amplum, et aëre bene perflatum, et subfrigidum esset &c.* I wish, I say, by taking notice of the following passage, he had done me justice with his pupils, who after the hints which he has thrown out against my practice in this distemper, will scarce expect to find in the chapter on the jail or hospital-fever (in all the editions) this plain admonition, yet almost as strong as any of the ancients upon such a subject: “ In the first
 “ state (*viz.* of the hospital-fever) as well as in all the
 “ rest, the fundamental part of the cure is to remove the
 “ patients out of the foul air. When that cannot be done,

* Observ. part iii. ch. vii. § 5. page 316.

“ the room or ward is to be purified by making a succeſ-
 “ ſion of air by means of fires, or letting it in by doors
 “ and windows, diffuſing the ſteams of vinegar, or the
 “ like; for whatever medicines are given while the cor-
 “ ruption of the air continues, or indeed increaſes by
 “ the *effluvia* of the ſick, there can be little hopes of
 “ recovery. Therefore in every ſtage, though the pa-
 “ tient can breathe no other infectious air but that of his
 “ own atmosphere, it will be neceſſary to keep the cur-
 “ tains open, and to uſe all other means to procure a free
 “ ventilation. On the ſtrict obſervation of this rule, the
 “ cure will in a great meaſure depend *.” As to the cau-
 tion of not loading the ſick with blankets, I confeſs I have
 omitted giving any of that ſort; becauſe in this country
 phyſicians do not ſuppoſe that a patient, in any fever, is
 to lie warmer than in his beſt health. To this cool ma-
 nagement, it may be obſerved, that I add the uſe of acids,
 and recommend the loweſt diet; ſo that hitherto there is
 no reaſon to apprehend any inflammatory ſymptom from
 my regimen. The ſmall proportion of the contrayerva-
 root, in the compound powder of the *London* Diſpenſatory,
 in the doſe which I ſpecify †, occasions no ſenſible heat,
 eſpecially as it is joined to nitre. The camphire can only
 heat by accident, when it diſagrees with the ſtomach, and
 then it was always laid aſide.

* Obſerv. part iii. ch. vii. § 5. p. 305.

† In a ſcruple of this medicine (which was my common doſe, repeated once in ſix hours) there are only about five grains of the contrayerva-root, and the reſt of the compoſition is a teſtaceous powder.

It was therefore only in the advanced and low state of this fever, that I began to support the strength by medicines of a cordial nature, and yet with such effects as rather to abate than to augment the ardour. By these, and especially by wine, I will venture to affirm, that I have frequently seen every symptom soon change for the better, that is, the head become clearer, the skin cooler, and the thirst less; and indeed this is not to be wondered at, when we consider how probable it is, that the putrefaction, gaining ground by the sinking of the *vis vite*, occasions that acrimonious heat so remarkable in this disease. Here, the salt of hartshorn was only used occasionally in great depressions; and even in other cases I have never been sensible of its raising any inflammatory or fixed heat, but only a momentary glow. The constant medicine was the alexipharmac decoction, consisting of the Bark and snake-root, with a small proportion of the *aqua alexeteria spirituosâ cum aceto*. It is to be hoped, that though the alexipharmacs have been long abused, as to the choice, the quantity and application of them, yet no offence will be taken at the name. Four spoonfuls of that decoction, once in four or six hours, to a soldier with a sunk pulse, lying in an open bed, seldom occasioned any extraordinary heat; if it did, I either lessened the dose, or, believing the time not yet proper for administering any warm or strengthening medicine, I suspended its use for a day or two longer. The disgrace of alexi-

pharmacs

pharmacs has been chiefly owing to the opiates joined to them, as in the *theriaca*, *diascordium* &c. but in the hospital-fever these last were never used, unless in order to check a colliquative looseness; or about the *crisis*, when the patient was worn out by want of rest: at such times I have known the opiates very serviceable.

In fine, Dr. *de Haen* may be assured, that the regimen which I propose stood at first on no other foundation than experience, after my having seen the bad effects of a contrary method, whether by too large, or too frequent bleedings in the beginning, or by giving hot things too early, in order to raise the pulse when it began to sink, or to force a *crisis* before the common period of the disease. Some of the medicines may be superfluous, but I am pretty sure that none of them are hurtful. The first perhaps might have been omitted, I mean the diaphoretic powder (consisting of the *pulvis contrayervæ compositus*, camphire and nitre) since I never knew the fever shortened, or any symptom abated by its use. But having once got into a method, which brought about as many cures as seemed otherwise consistent with the circumstances of the patients, lying in a foul air, amidst a constant noise, and often neglected by the nurses, I did not attempt to reduce my practice to a greater simplicity than appears in the former editions of this book. Yet, whatever confidence I may have in the directions which I have published, I am still ready to alter any part of them, upon a fair representation
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from those who have had equal opportunities with myself of seeing and treating this fever. But to oppose either mere theory, or analogy from other fevers, where the similarity is so disputable, or to oppose some general maxims from *Hippocrates* or *Sydenham* to the observations which I have offered, as the result of a long and painful practice, in a distemper that no physician could well know but in such circumstances as mine, is a manner of writing, I must say, more fitted for disputations in a school of medicine, than for the instruction of a practical physician.

II. I must unwillingly take notice of some more inadvertencies of the learned Dr. *de Haen* with regard to me; for treating of camphire, he says, *Quantisne laudibus effertur in malignis camphora, veluti collapsas vires blandè restaurans, et somnum ipso opio tutius adducens! Consulite modò egregios viros Huxham & Pringle* *. The author then proceeds to say, that the physicians of *Breslaw* found no such virtues in that medicine, in a malignant epidemic of that country; but, on the contrary, observed that it rather did harm. Now, the reader must be surprized when I affirm, that I have no where assigned either a *purgative* or a *restorative* quality to camphire, nor used any expressions to that purpose. I mention my giving it in inflammatory fevers, but with no other intention than in order to assist in abating the spasms, and promoting a *diaphoresis*; and when I pre-

* DE HAEN Ratio Medendi, part. iii. cap. i.

scribe it in the high *delirium* sometimes attending the hospital-fever, yet even there I say nothing of those alledged qualities, but only offer it as one of the best internal medicines for that symptom, that is, as one of the best which I then knew. This in truth was saying but little in its commendation. In my experiments I have indeed assigned to camphire a considerable antiseptic power; but that has nothing to do with the virtues in question, nor have I, for that reason, ever given it the more freely. It would seem as if Dr. *de Haen* finding such a conformity between Dr. *Huxham* and me, with regard to the jail or hospital-fever, believed the harmony to be so great, that whatever is written by Dr. *Huxham*, I must be of the same opinion and answerable for it.

III. Further, Dr. *de Haen*, in the first part of his book called *Ratio Medendi*, mentions some experiments, which, in imitation of mine, he had made with antiseptics upon urine; when he found, that acids resisted its putrefaction more than any of the alkaline salts, the spirit of hartshorn excepted. In this the learned author does not contradict me, as some of my friends have imagined, since not doubting of the antiseptic quality of the acid salts being in general superior to that of the alkaline, I never made any comparative trial. Nay, I have here the satisfaction to find a person of Dr. *de Haen*'s credit confirming, in this instance, what I long ago advanced, *viz.* that the volatile alkalis are powerful in preserving animal substances from

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corruption. I only wish that Dr. *de Haen* had mentioned his experiments with more precision, and in particular had told the proportions which he used of the acids and alkalis; since it must seem a greater paradox than any that I have yet advanced on the subject, that, quantity for quantity, the spirit of hartshorn should resist putrefaction more than any of the mineral acids. But when in the next paragraph the author adds, *constititque urinam alcalicis* (viz. *salibus alcalicis fixis*) *mistam longè citiùs putrescere eâ, cu' affusum nihil*, that is, "that a portion of urine mixed with
 " the fixed alkaline salts putrefied sooner than another
 " portion to which nothing was added;" here indeed is a plain contradiction to the conclusions I have drawn from my experiments, which allow of no septic quality in any of those salts, fixed or volatile.

In order therefore to see which of us were in the wrong, about the end of June 1760, I made the following experiment. I took three phials, of between three and four ounces each, and into each poured an ounce of recent urine made by a person in health; to one, I added five grains of salt of hartshorn (as being of a more constant strength than the spirit, which so much varies according to the manner of preparation, and the time it is kept;) to another, I added as much of that salt which is sold in the shops for *sal absinthii* (but which, in fact, is a thoroughly calcined lixivial salt drawn from the ashes

of any of the common vegetables;) to the third, I joined nothing, reserving it for a standard. These phials being corked were placed in a closet of a southern aspect; so that considering the season they stood moderately warm. Upon the first mixture, the phial with the salt of hartshorn had scarce any other smell but that of the volatile salt. The phial with the salt of wormwood, upon shaking, became turbid, and of a whitish colour, without any effervescence; but it had that disagreeable smell which I have always taken notice of upon mixing animal substances with the lixivials. The next day the standard was not so fresh as at first; the phial with the salt of hartshorn smelled as before; and that with the fixed alkaline began to have the smell of a volatile salt, but less disagreeable than that of stale urine. In two or three days longer I could scarcely distinguish between the smell of the urine with the salt of hartshorn, and that with the salt of wormwood; and this resemblance continued for twenty-four days, after which I examined these mixtures no longer. With regard to the standard, it remained all that time with a sickish offensive smell, neither like that of salt of hartshorn, nor that of corrupted flesh or blood; and I had observed, that sometime before, it had gathered a mouldiness upon its surface.

In the beginning of September following, to an ounce of recent urine poured into a wide-mouthed phial, I added six or seven grains of fixed alkaline salt as before;

and into another phial I put as much urine, without any addition, to serve for a standard. These phials were set in a place somewhat damp, open to the air, but under cover, to prevent any rain from falling into them; for they were not corked. The mixture with the fixed salt, upon shaking the phial, became turbid as formerly, and afterwards dropped a whitish sediment, which ought to have been taken notice of in the first experiment. The smell of this phial, upon the mixture, was disagreeable as before; the next day it was less so; and on the third day the smell began to change to that of salt of hartshorn, which gradually increased, but with some degree of rankness like that of common stale urine. The standard, for about eight days, had no smell of a volatile salt, but was otherwise offensive; and upon its surface I perceived a mouldy scum thicker than that in the former experiment. I took no further notice of these phials till about the thirteenth day, and then I found them both smelling like salt of hartshorn; but the standard, that is, the urine by itself, ranker or more offensive than the other. At the same time I found the contents of the standard of a deeper colour, which I considered as another proof of its higher degree of corruption. For, I have constantly observed, that urine becomes of a browner cast in proportion to the time it is kept, till it be thoroughly putrid; and in this case the *criterion* is the furer, as the fixed alkaline salt, when the urine settles after the mixture, makes
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it darker than natural ; that is, on the second day of this experiment, the water with the fixed alkali was not so pale as the standard, but was paler than it on the thirteenth.

After this, I made no further trials, being satisfied that I had not been in the wrong about the general antiseptic power of the fixed alkaline salts, and that I had discovered the cause of Dr. *de Haen's* error. It is well known, that urine not only contains some of the corrupted parts of the humours (which Nature throws off by the kidneys, as well as by the skin) but likewise a large quantity of a salt of the ammoniacal kind, that is, one compounded of a volatile alkali and an acid. Now, this acid having a greater affinity with the fixed alkaline salt used in the experiments, than with its own volatile salt, abandons it, and cleaving to the fixed salt suffers the other to evaporate ; much in the same manner as we produce a volatile urinous smell, upon adding salt of wormwood, or salt of tartar, to a solution of *sal Ammoniacus*. Only in the case of urine, the combination of any fixed alkali with the acid of the urine, and the evaporation of the volatile salt of the urine, consequent thereupon, is slow, on account of an oily or mucous matter with which that fluid is likewise impregnated. It does not therefore follow, because putrefying urine always lets go its volatile salt, that all urine parting with this salt, is in a putrid state. For, the same kind of salt, with its volatile smell, rises from the most recent urine upon distillation ;

lation; and, without that process, instantaneously upon mixing some quick-lime with it. Nay, a fixed alkaline salt will immediately disengage the volatile, and thereby give the stale smell, if the fixed salt be dissolved in fresh urine made boiling hot. Even within the body, an animal process will separate this volatile alkaline salt, as I had once an occasion to find in a person, who had been long under a course of Mrs. *Stephen's* medicine, that is, of taking large doses of lime and a fixed alkaline salt. This gentleman's urine, when quite recent, had not only that volatile smell which I mentioned, but strongly effervesced with the common acids. This experiment he shewed me, immediately after making water, upon my seeming to doubt whether he had not been mistaken.

I therefore suspect that Dr. *de Haen*, not reflecting on this chemical principle, has been deceived by the volatile saline smell of the urine (occasioned by the mixture of a fixed alkali) which he mistook for the putrid *fætor* of that fluid; and that though convinced, by his own experiments, of the strong antiseptic quality of salt of hartshorn, yet he could not thoroughly free himself from the common error, of confounding the volatile saline with a putrid smell. But this distinction between an alkaline salt and putrid matter (in an animal substance falling into a state of resolution) which I attempted to explain in the preceding work, is at present set in the clearest light

light by the learned M. Gaber of Turin; of whose experiments, and just reflexions upon them, I shall now take notice.

IV. Some time ago, I received from that gentleman the present of a book, lately published, called *Miscellanea Philosophico-Mathematica Societatis Privatae Taurinensis*, accompanied with an obliging letter; of which, I hope, he will excuse me for giving the following extract. *Ex tuis experimentis mea nata sunt, quorum aliqua in hoc libro perlegere possis; reliqua, quæ nondum ita absoluta sunt ut publicam lucem mereri videantur, in posterum, si libenter feras, tibi communicabo: Hæc autem experimenta, cum plerumque tuis consentanea fuerint, in eâ tamen re a te me dissentire cogunt, quod alcali existentiam in corruptis humoribus dubiam reddidisti; rationes propterea proposui quibus eventuum dissimilitudinem describendam putavi, quas tu ipse facilius, quam ego assequi poteris, si tuam experiundi methodum cum meâ comparare volueris.*

The point in question relates to my first experiment, which shews, “ that bodies, by putrefaction, become little, if at all, alkaline.” But the ingenious author, in the paper which he alludes to in his letter, clearly proves, “ that the marks of alkalescence, in putrefying animal substances, are greater or less, or none at all, according “ to the time in which the experiment is made after the “ putrefaction begins; that such substances, upon their “ first putrefaction, do not effervesce with acids; that “ afterwards

“ afterwards they effervesce manifestly with them; but
“ that at length they cease from doing it, though the
“ putrefaction still continues.” The experiments proving
these facts being repeated with so much clearness and
precision, leave me no room to doubt of the truth of
what M. *Gaber* suspects, viz. “ my having made the trials
“ of effervescence upon putrid bodies, either before they
“ were sufficiently corrupted, or after the volatile alka-
“ line salt was wholly evaporated, though the process of
“ putrefaction still went on.”

At this distance of time I cannot sufficiently recollect
the circumstances of my experiments, whereby to judge
whether the acid was dropped into the putrid liquors be-
fore, or after the exhalation of the volatile salt; but as I
am satisfied that it might have been the one or the other,
I must submit to M. *Gaber*'s correction, and allow, that
whilst animal substances are in a state of putrefaction,
there is a time when they will afford marks of an alka-
line salt, by their manifest effervescence with acids. And
I am the more inclined to yield to his opinion, as I can
now produce a case somewhat parallel to what he men-
tions, relating to the effervescence of morbid bile with
acids.

A gentleman of thirty-six years of age, who died of a
dropy following an obstinate jaundice, was opened about
twenty-four hours after his death. The liver, by its ten-
derness,

dernefs, feemed to be in a corrupted ftate. The gall-bladder was full of bile, and three times larger than is common. The *ductus communis* was fo clofely ftopped at its entry into the *duodenum*, that no bile could be fqueezed out of the bladder into that gut. As the diffection was made by candle-light, I could not then examine the bile; but the next morning, Mr. *Forbes*, the furgeon who had opened the body, returned to the houfe, and at my request made the following experiment upon that liquor, which had been kept all night in a tea-cup, in a room without a fire, in the winter-feafon. He divided the bile into three portions; to one, he added fome fixed alkaline falt; but that occafioned no change in the colour, which was of a dark green; into another, he dropped fome fpirit of vitriol; into the third, fome common vinegar; and he obferved in both thofe a manifef effervescence, with a change of the colour to a light green. The experiment was purfued no further; but I doubt not, that had the bile been allowed to corrupt longer, the effervescence would have appeared lefs and lefs, and at laft have intirely ceafed, by the feparation of the alkaline from the corrupted parts, agreeably to the obfervations of M. *Gaber*. But from all this it appears more and more evident, “ that the volatile falt, in animal fubftances, is very “ different from the putrid part; that an animal fubftance “ may abound with this volatile alkali, and yet not “ be the more corruptible; and on the other hand, be “ highly

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“ highly putrid, without any mark of alkalescence; last-
“ ly, that the volatile alkaline salts are all of an antiseptic nature.” These principles, which I endeavoured to establish, have been more fully demonstrated by M. *Gaber*; and I must set the greater value upon his labour, as it has satisfied the learned M. *de Haller*; who, in the second volume of his *Physiology*, makes several objections to my opinion about the distinction to be made between putrid and alkaline substances; but afterwards, whilst his book was still in the press, having seen M. *Gaber*’s paper upon that subject, in the last page he candidly acknowledges that the experiments of that gentleman had fully reconciled him to my sentiments on those matters.

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A GENERAL



A GENERAL INDEX.

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F I N I S.

E R R A T A.

Page 96. line 11. for *Vigetius* read *Vegetius*.

Page 108. line 5. for *Hale's* read *Hales's*.

Page 129. To the extract of Dr. Clerk's letter, subjoin the following paragraph. Some doubts arising, since Dr. CLERK's death, about the dose of his squill-mixture, I consulted his son Dr. DAVID CLERK, one of the physicians to the Royal Infirmary at *Edinburgh*, who informed me, that he believed there was a mistake, in the extract of his father's letter, of *acetum scilliticum* for *syrupus scilliticus*; and that his father did not give the *spiritus Mindereri* mixture in the same quantity with, and without the *syrupus scilliticus*. He added, that he had found in the *Liber Memorialis* of his father the following receipt: *R Aquæ hyssopi (vel cinnamoni sine vino) spiritus Mindereri, syrupi scillitici aa. ℥ij. misce. Dentur cochlearia ij. bis die.* That this was his father's common dose of all his *julapia scillitica*; but that when the stomach could not bear so much in the morning, he then gave but one spoonful. That he himself did not particularly remember how much of this mixture his father gave in the pleurisy and peripneumony, but believed that the quantity did not exceed four or five spoonfuls in the day. He concluded with remarking, that considering the different manner of making the vinegar of squills here, and at *Edinburgh*, the *London* preparation was likely to be much stronger than the other.

Page 331. line 8. for council read counsel.

Appendix, page *xlviij.* line 9. for was read were.

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